677
TR-2

TEXTILE MANUFACTURER

MATERIALS · PROCESSES · PRODUCTION · MANAGEMENT

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WILSON & LONGBOTTOM Ltd.
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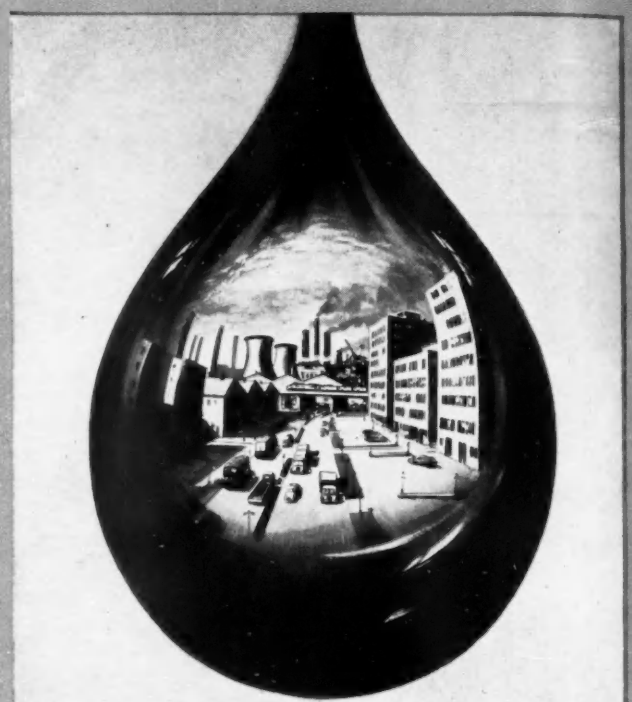
Lubrication tests at R&M smooth the flow of power



I understand Ransome & Marles make a special study of lubrication problems?

We do indeed. A bearing's performance is governed by correct lubrication as much as by correct design and materials. The cage location area is one of vital importance. The lubricant must also protect the highly finished surfaces from corrosion and help to dissipate any undue heat. To fulfil these requirements, we have a team of lubrication specialists at work.

What special lubrication problems do they have to deal with?

Our Technical Department study each case individually before making their recommendations. They may advise on grease for horizontal or vertical shafts, with the correct housing design and method of packing. If oil is used, the recommendation may involve lubrication by oil splash, a controlled oil level, drip feed or wick feed, and so on. All the time, of course, the various oil companies are developing new lubricants and these we subject to stringent tests before we recommend them for any application.

What about lubrication at ultra-high speeds?

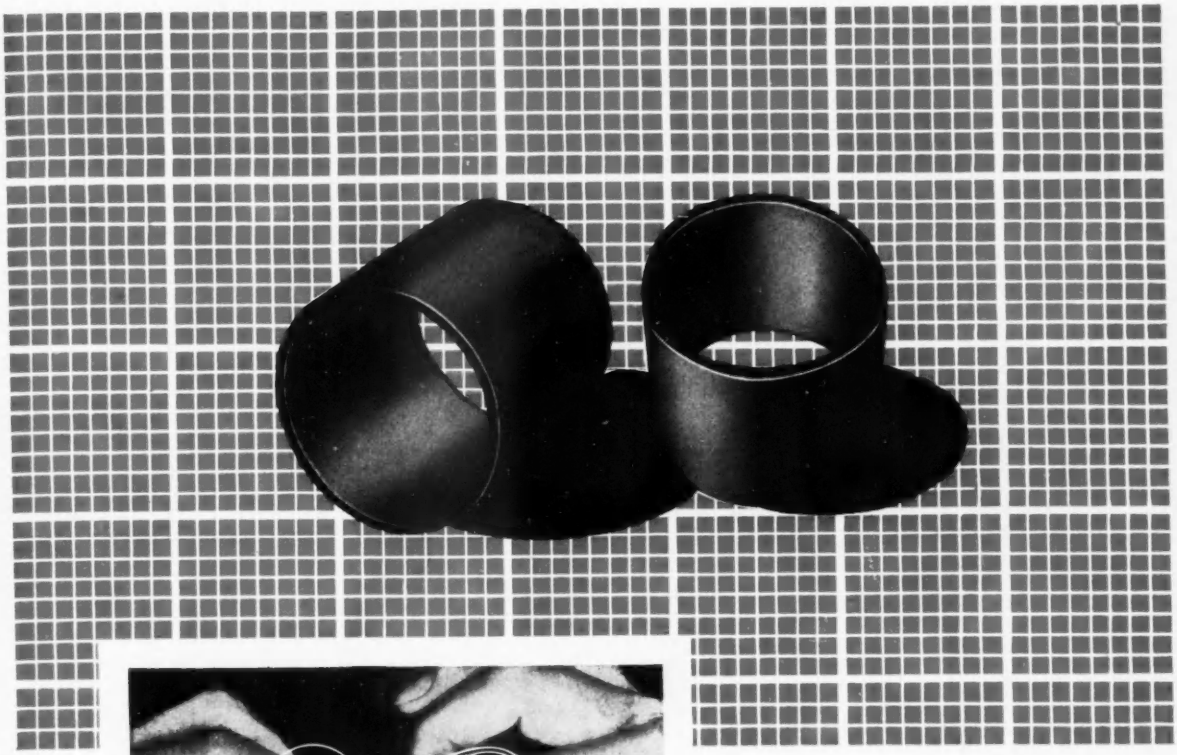
Research into this is continuous. Operating speeds, loads and temperatures are steadily rising and every week brings fresh problems for solution. Aircraft and guided missiles are the obvious—but by no means the only—instances. Speaking generally we recommend lubrication by oil flood or vapour mist for the very highest speeds. We have built up extensive data on this and allied problems. If you get in touch with our Technical Department they'll be only too glad to talk lubrication with you.

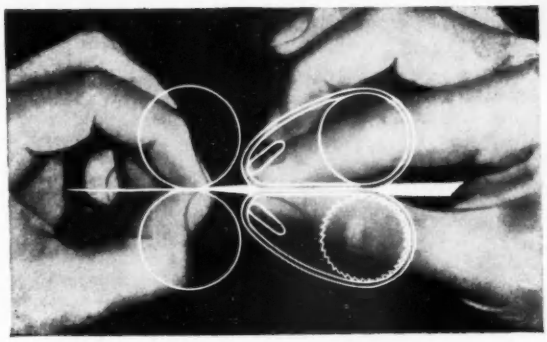
RANSOME & MARLES BEARING CO. LTD.

Newark-on-Trent England

Telephone Newark 456

Telex 37-306





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MR. THERM *BURNS* TO SERVE YOU *ALWAYS*
in all ways

AND – 11 million housewives cook by GAS!

GROOVED CYLINDER CONE WINDER

B-K-N

It is the aim of the modern textile mill to attain highest output at reduced costs, thereby increasing productiveness. The BKN-pattern winder fully meets these demands. Gentle handling of the yarn is ensured even at a speed of 1300 yards/min, at which the machine runs smoothly due to hydraulic damping devices. The operative times being reduced to a minimum, the efficiency of the machine is very high and the cost of winding low.

Schlafhorst

Saurer-Allma

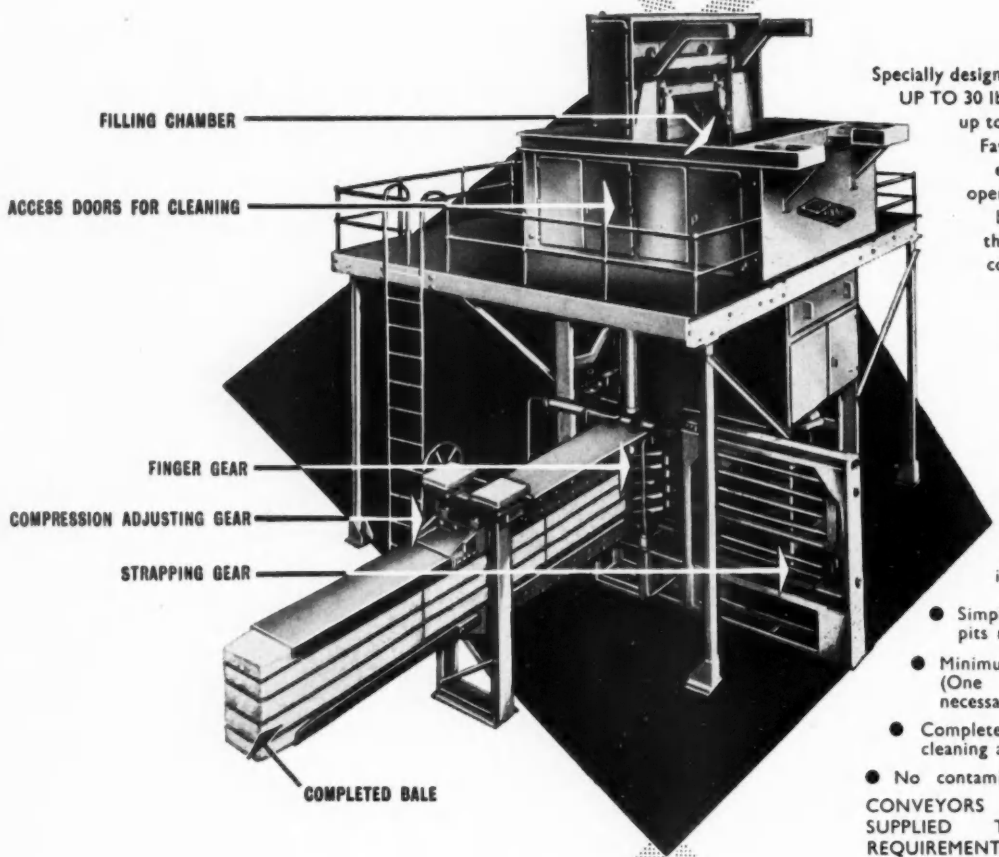
W. SCHLAFHORST & CO. M.-GLADBACH GERMANY

THE FAWCETT

HORIZONTAL SYNTHETIC

FIBRE BALING PRESS

FOR AUTOMATIC OPERATION



Specially designed to handle BALES UP TO 30 lbs/cu. ft. density and up to 400 lbs. weight, the Fawcett Baling Press is entirely automatic in operation with the fibre being delivered from the spinning lines by a conveyor and weigher direct to the trampling box. Full safety measures are incorporated throughout the full cycle of operation whether automatic or hand controlled. Outstanding advantages of the Fawcett Press include:—

- Simple installation. (No pits required)
- Minimum labour costs. (One operator only is necessary)
- Complete accessibility for cleaning and maintenance.
- No contamination of material.

CONVEYORS AND WEIGHERS SUPPLIED TO CUSTOMERS REQUIREMENTS

PRESS FRAME AND BOX OF ALL-STEEL 'COLCLAD' CONSTRUCTION
HYDRAULICALLY OPERATED MAIN RAM WITH ADJUSTABLE STROKE & PRESSURE REGULATION
HOPPER DOOR OF MILD STEEL 'COLCLAD' PLATE PNEUMATICALLY OPERATED & FITTED WITH HOOD
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AUTOMATIC SELF-STRAPPING OF BALE
INDIVIDUAL CONTROL OF EACH OPERATION

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(Incorporating Finney Presses Ltd.)

BROMBOROUGH CHESHIRE

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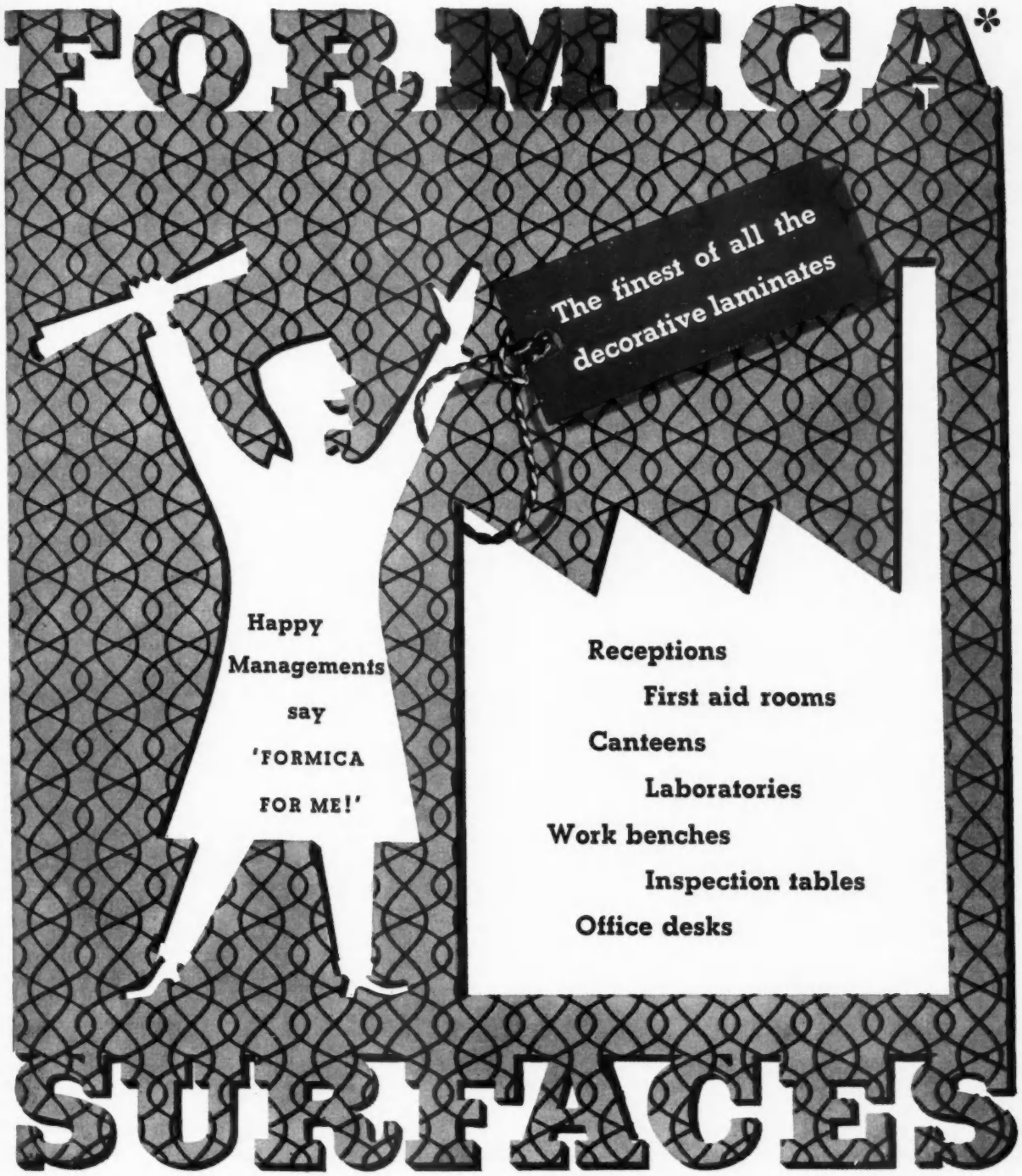


Modern factory managements see efficiency from two angles, and see an answer to both in FORMICA surfaces. For FORMICA laminates are not only simple to keep clean and immensely resistant to wear (those smooth, hard surfaces prevent snags), but their charm and colour boost morale! Your own maintenance staff can do the whole job . . . or you can call in a fabricator if you like. FORMICA, the finest of all the decorative laminates!

* Formica is a regd trademark Formica Ltd, Dept F, De La Rue House, Regent Street, London W1

ELLISON LIMIT SWITCHES

cannot "fail to danger"

Extract from the Factory Inspectors Report 1955*:*

"With the growing use of automatic controls, more and more limit switches are employed. Designers of these do not always consider the consequences of 'failure to danger', which can easily occur with most types through the development of a small defect. The consequences of such failure are of the greatest importance where the limit switch is introduced to guard a dangerous part of machinery or plant.

"An examination of a representative selection of switches was undertaken, and one result which emerged was that a switch relying on springs could not be expected to 'fail to safety' in all circumstances."

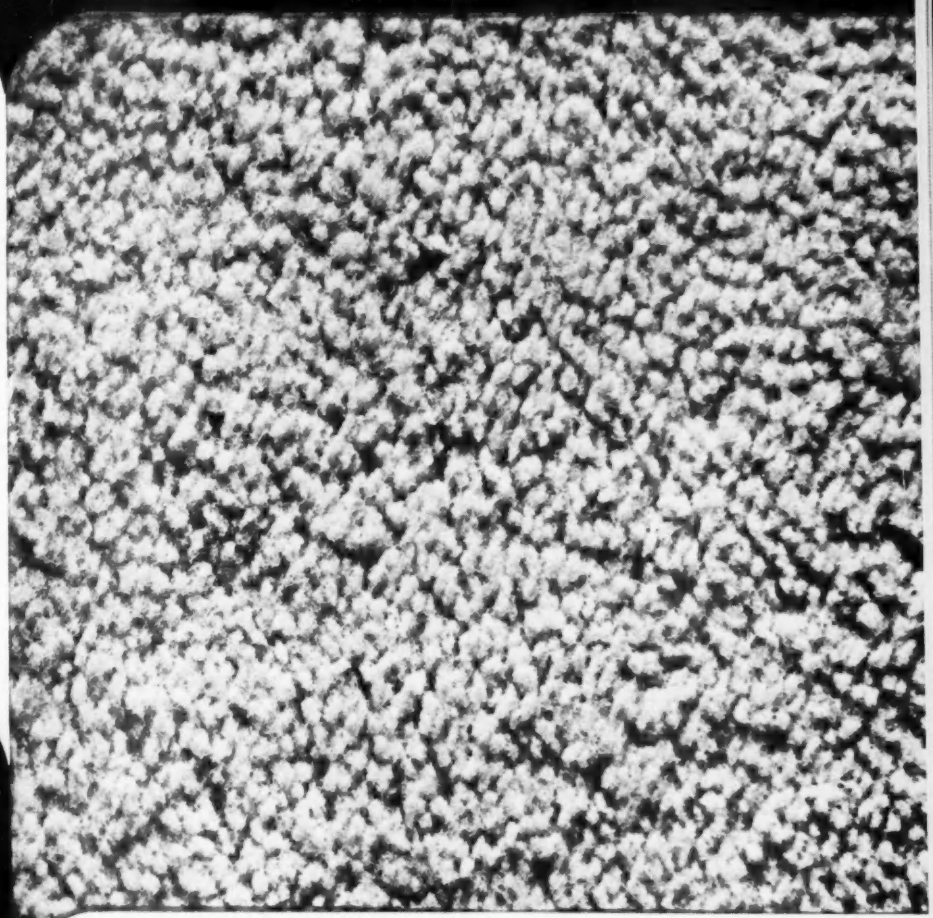
One of the many advantages of the well-proved Ellison Limit Switches is that should springs break, a mechanical knock-off device ensures that, whatever the circumstances, the switch will be operated by the tappet. Write for Descriptive List No. 11.

GEORGE ELLISON
LIMITED
BIRMINGHAM ENGLAND

Continuing a Tradition

78

finest for **tufted** *carpets*



yarns

from the world's largest spinners

LARGE PACKAGE CONES
SINGLES ALSO TWOFOLDS AND THREEFOLDS
SUPPLIED IN GREY OR SPUN-DYED

MIXED DENIER
VISCOSE YARNS AND BLENDS
WITH OTHER MAN MADE FIBRES

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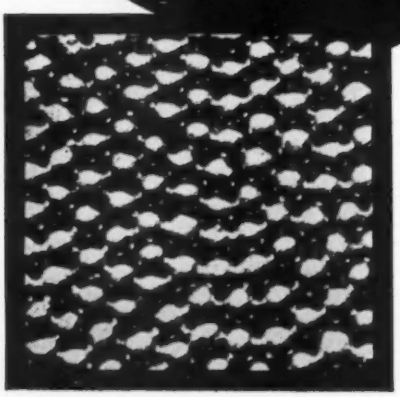
for rigid precise

filtering of

liquids or gases

BOUND BROOK BRONZE FILTERS



This microphotograph shows a section of a Bound Brook filter. Note the porous structure formed by the use of spherical powdered metals.

The development by Bound Brook of a porous material for the filtering of liquids and gases is the result of many years' experience in powder metallurgy. It is produced from spherical metal powders of *closely controlled particle size* to give a rigid porous bronze structure of *uniform pore* dimensions. This metallic structure has excellent resistance to impact, is suitable for high pressure filtration in both directions of flow, better resistance at *high temperature* than wool, cotton, paper or plastic filters, and enjoys an almost indefinite life. The material is easily cleaned either by washing or by reversing the flow. Designed for such applications as filter elements, flow control devices, flame traps, etc., Bound Brook filters are available in six grades to suit required conditions and in the form of discs, plates, cones, cylinders, etc. Special shapes can be made to suit customers' requirements. Special cupro-nickel is available for corrosion resistance.

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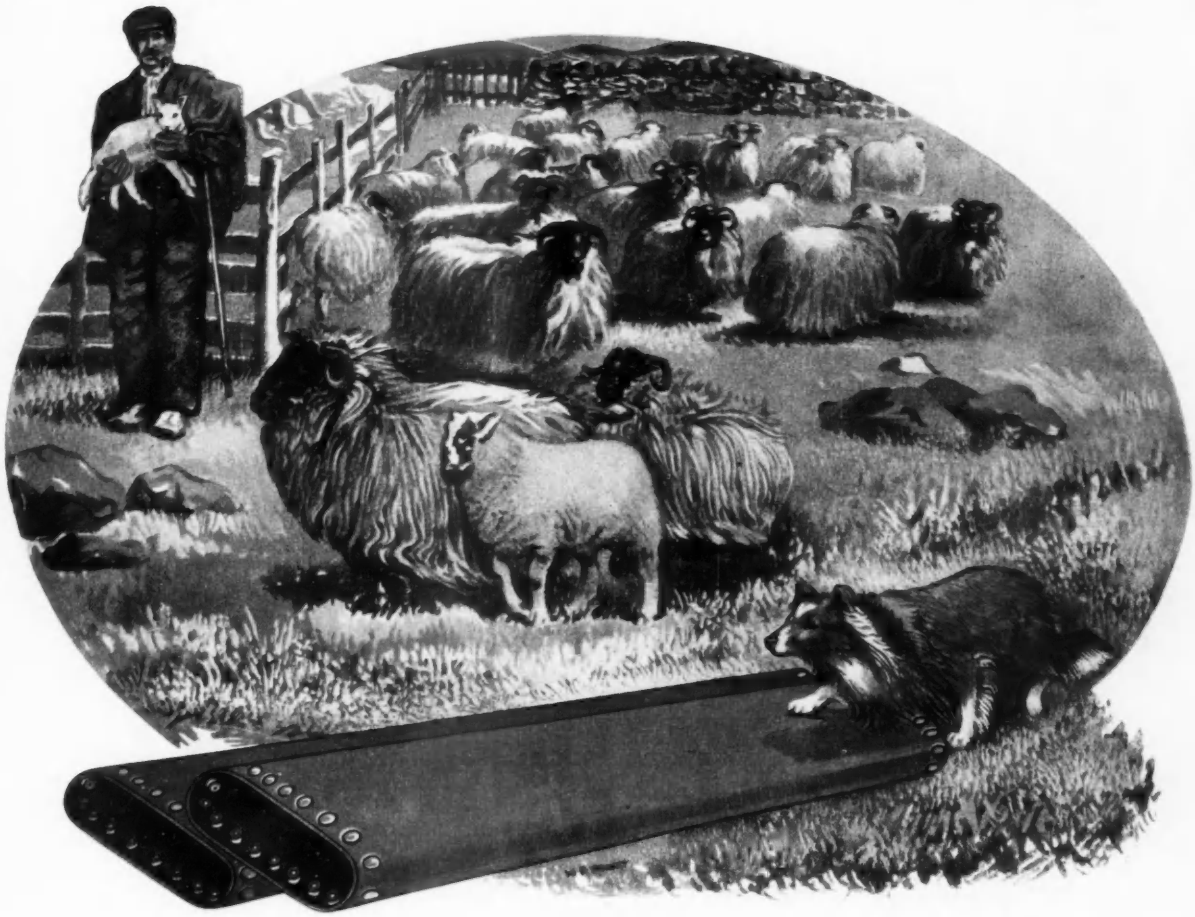

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Dayton Works Dundee

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Rats, rats, bowler hats and spats, in the store, as the soldiers' song goes. Rats in the warehouse, workrooms, kitchens . . . Do you look aghast at the destruction and spoliation of your goods by these filthy, disease-carrying vermin, or by mice, fleas, bugs, crickets, ants or cockroaches? Don't write it off as an unavoidable annual loss in your books but call in our pest destruction service to clear and protect your property. Pick up the telephone and call our nearest depot NOW.

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SOUTHAMPTON: 14 Howard Road, Shirley. Tel.: Southampton 25307

LEEDS: 21 Upper Mill Hill. Tel.: Leeds 2-5266

LIVERPOOL: 8a Rumford Place, 3. Tel.: Central 2068

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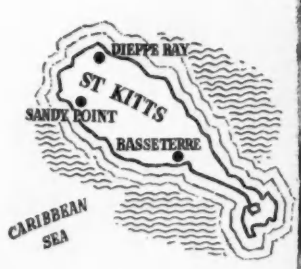
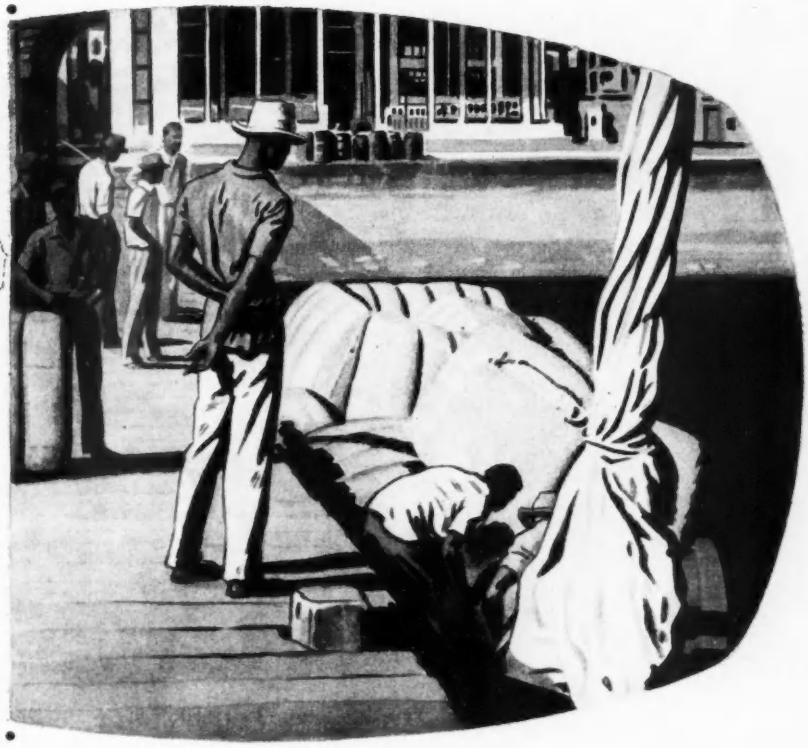
BIRTH AND BREEDING COUNT



BIRTHPLACE OF SYLEX

The illustration shows Sea Island Cotton being loaded on lighters at St. Kitts. This is one of the beautiful Leeward Isles, a group of the smaller islands in the West Indies, famous for their Sea Island Cotton.



The Aristocrat of Cottons

Grown in the West Indian Sea Islands Groomed by FINE SPINNERS & DOUBLERS Ltd

To the mills of Fine Spinners and Doublers Ltd, comes the pick of the Sea Island Cotton crop from the tropical paradise in which it is grown. When the bales are opened up the cotton looks much like any other long stapled raw cotton. But it is indeed far from being ordinary cotton when we, with our long experience in the spinning of Sea Island Cotton yarns, bring out its unique characteristics. These derive from the ideal conditions under which it is grown and to which it owes its great fineness, high lustre and strength. Before it emerges as SYLEX, strength is added to strength by our famous SYLEX two-ply construction. Thus the fabrics made from our SYLEX Sea Island Cotton yarns are altogether outstanding in their appearance, comfort and long life.

"SYLEX" is the registered trademark of:—

FINE SPINNERS AND DOUBLERS LIMITED

ST. JAMES'S SQUARE, MANCHESTER 2. GRAMS: Distaff, Manchester 2

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Leicester Office:	BRITANNIC HOUSE, 142 CHARLES STREET	Tel.: Granby 1044/5
Nottingham Office:	FRIARY CHAMBERS, FRIAR LANE	Tel.: Nottingham 53595/6

Interior view of Corrugated 'Perspex' installed over 10 years ago in the Dyeworks of S. Smethurst & Sons Ltd.

Yet another factory proves Corrugated 'Perspex' efficient as ever after 10 years

S. SMETHURST AND SONS LTD. are one of many firms who have proved the lasting qualities of 'Perspex'. Installed in their dyeworks at Bury over 10 years ago—giving as efficient service as when it was installed.

Corrugated 'Perspex' is the answer in all buildings, large or small, where it is important to have good light. No other roof lighting material transmits more daylight. It is tough, light in weight, easy and economical to install. Once in, there is an immediate saving on artificial light. It is built to withstand the severest weather and is unharmed by the corrosive atmosphere of industrial areas.

Corrugated 'Perspex' is made in a wide range of profiles to match most corrugated roofing materials. If diffused daylight is required, Opal Corrugated 'Perspex' is available.

It's as clear as daylight—it must be

CORRUGATED 'PERSPEX'

'Perspex' is the registered trade mark for the acrylic sheet manufactured by I.C.I.

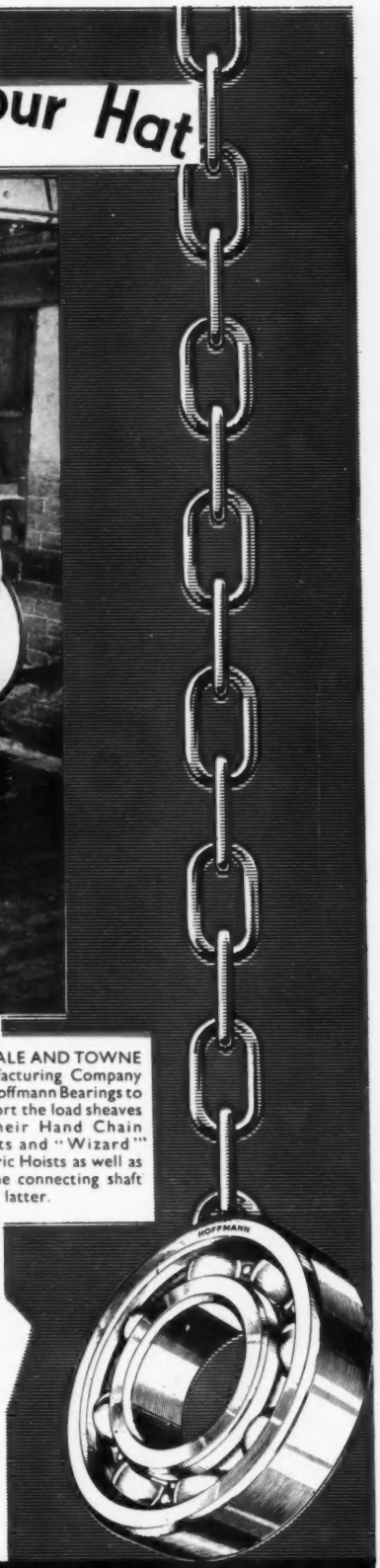
IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1

CP.146

Almost as easy as Raising your Hat!

Once again, Hoffmann Bearings are seen to reduce manual effort. This YALE hoist, lifting a weaver's beam, has greatly-increased efficiency due to the fitting of Hoffmann ball bearings.

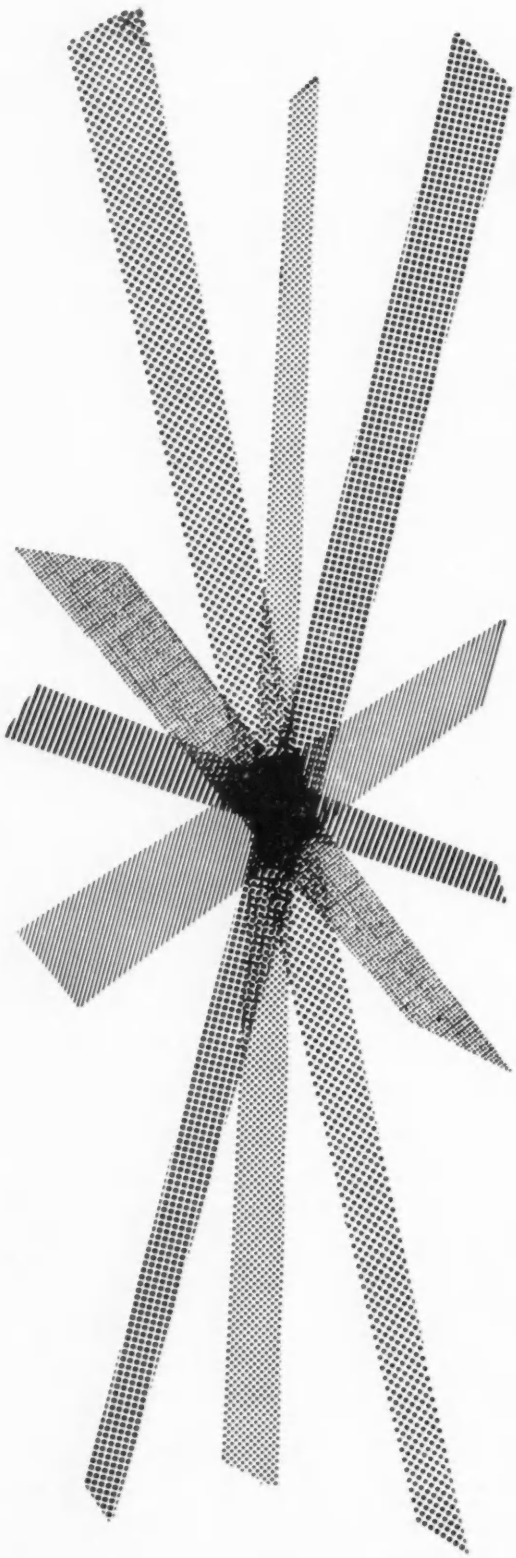
The YALE AND TOWNE Manufacturing Company use Hoffmann Bearings to support the load sheaves in their Hand Chain Hoists and "Wizard" Electric Hoists as well as for the connecting shaft of the latter.



HOFFMANN

BALL AND ROLLER BEARINGS

THE HOFFMANN MANUFACTURING CO. LTD., CHELMSFORD, ESSEX



Courtaulds new CARRIER LB FOR DYEING 'TRICEL'

DOES *THIS*:

★ Gives shades of hue or depth so far unobtainable with other carriers

★ Increases the rate of dyeing in deep shades

★ Uses less dyestuff for all shades

★ Makes 'Tricel'/'Fibro' blends less prone to creasing by reducing dyeing time

★ Improves the handle of 'Tricel'/wool blends by reducing dyeing time

YET DOES *NOT* DO THIS:

★ Condense in the dyeing machine—Carrier LB is non-volatile

★ Impair the fastness properties of disperse dyes

★ Impair the pleat retention or pleatability of fabrics

Carrier LB—a pale self-emulsifying oil—is obtainable in 5 gall. cans (50 lb. lot) 3/- per pound, delivered

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orders, information and service—write to

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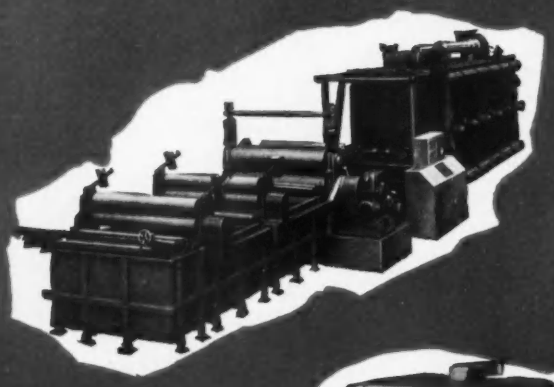
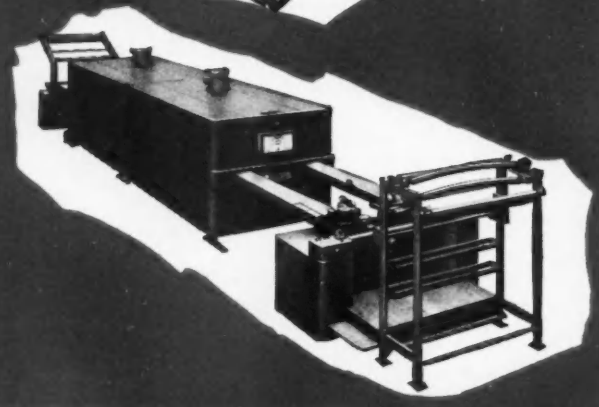
DA-H

MACHINABILITY
" That complex property which controls the facility with which metal may be cut "
BRYMILL STEELS are renowned for their " machinability "
BRYMILL TESTED STEELS
Bright drawn • Centreless turned • Bright heat-treated Bars
BRITISH ROLLING MILLS LTD., BRYMILL STEEL WORKS, TIPTON, STAFFS.

Talented Threesome
from Beech Works





From the range of textile finishing machinery manufactured at Beech Works we bring this talented trio into the limelight. The **E.G.W. Carboniser** (top illustration) incorporates the latest Open Width Acidizer with automatic acid strength control, and 3-stage Drying and Baking Unit. A completely synchronised plant, with comprehensive control panel for one-man operation.

The now well known **Mark III E.G.W. Velocitair Tentering Machine** (centre) is a multi-layer machine employing nozzle drying, which occupies extremely small floor space, and is suitable for all types of fabrics, from lightweight materials to heavy overcoatings, and even Mohair rugs.

The bottom illustration shows one of the more recent additions to the E.G.W. Range— the famous **E.G.W.-Vits Universal Stenter,** now manufactured under licence at Beech Works. This phenomenal machine incorporates the Vits World Record Drying System for the quick drying, shrinking or setting of fabrics, or for polymerising and processing of resin finishes.

FOR FURTHER DETAILS OF THESE MACHINES PLEASE WRITE TO OUR SALES DEPT.

E. GORDON WHITELEY
LIMITED

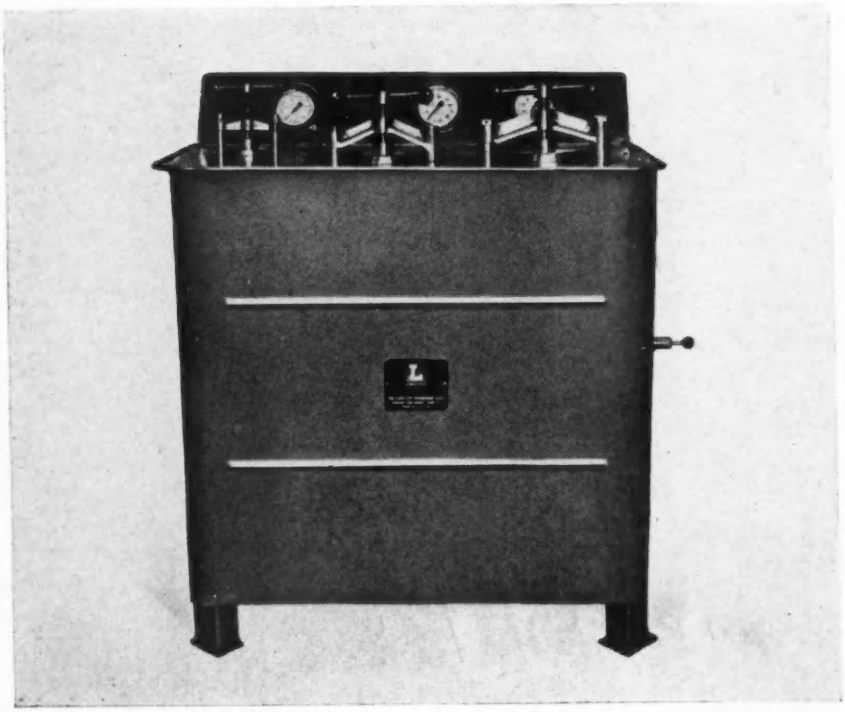
BEECH WORKS · MORLEY · YORKSHIRE

Telephone: Morley 501 and 923
Telegrams and Cables: Tentering, Morley

SPENSTEAD
blending plant
was supplied to Messrs. Petmar Industries Ltd., of Batley for their £1 million expansion scheme, making it one of the largest and most modern fibre and carpet plants in Europe.
This new plant greatly increases output by simplifying standardisation and the matching of colour and quality whilst effecting considerable savings in production costs.
SPENSTEAD
the complete system was designed, constructed and installed by
SPENCER & HALSTEAD LIMITED
BRIDGE WORKS OSSETT YORKSHIRE
OSSET 821/4 (4 lines)

LABORATORY PRESSURE DYEING MACHINE

The Pilot High Temperature Dyeing Machine is the latest addition to our range of stainless steel Dyeing and Bleaching Machines.



Simplicity in operation and suitability for operation at temperatures up to 130° C. make this an invaluable machine for testing new dyestuffs, preparing customers' samples, matching shades prior to dyeing on commercial machines and preparing samples for the design department.

WRITE FOR FURTHER DETAILS TO

LONGCLOSE ENGINEERING Co LTD
LEEDS ENGLAND

Tel. : LEEDS 21978 (3 lines)

SIR RICHARD ARKWRIGHT
(1732–1792)

Sir Richard Arkwright

AND COMPANY

Yarn Sales Division of English Sewing Cotton Company Limited

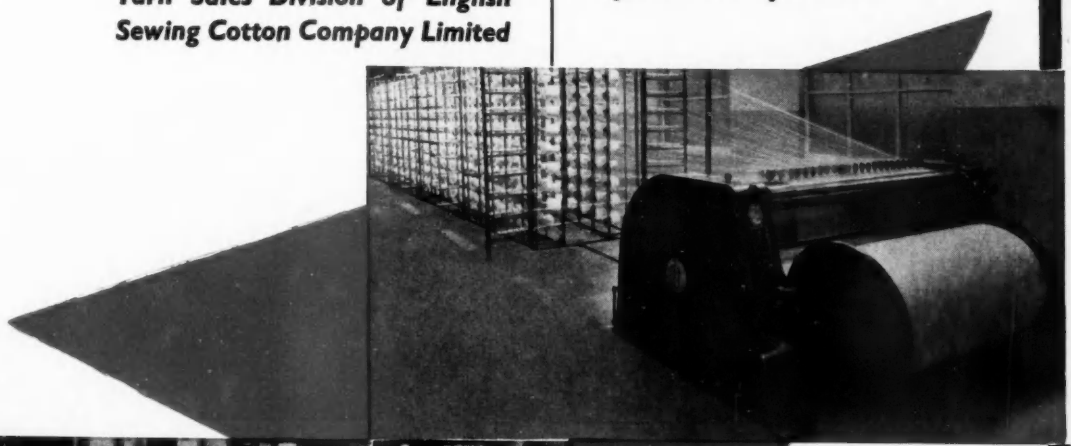
spinners, doublers

dyers and

processors of

cotton and

synthetic yarns



"Ban-Lon" reg. ***and***

crimp yarns

a

speciality.

Arkwright House, Manchester 3

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PHONE: LEICESTER 67210

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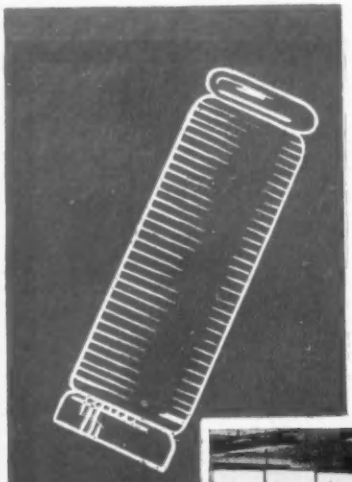
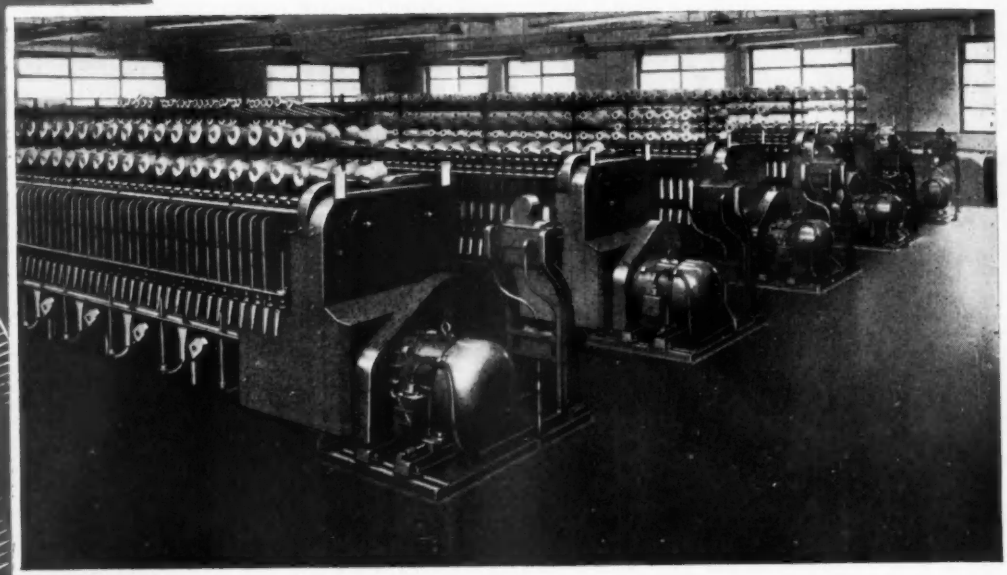
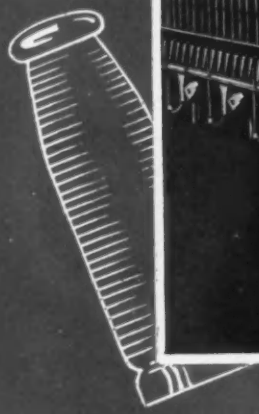


Arunco Machinery

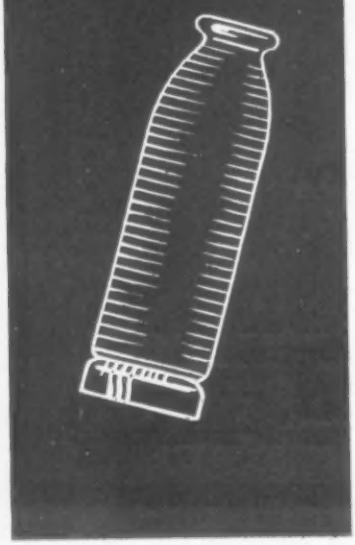




Arunco RING DOUBLING FRAME

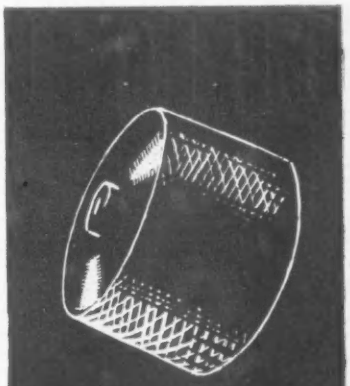
Specially designed for the Twisting of Woollen, Worsted and Fibro mixture yarns.

The above photograph shows the machines installed in a modern Worsted Mill.

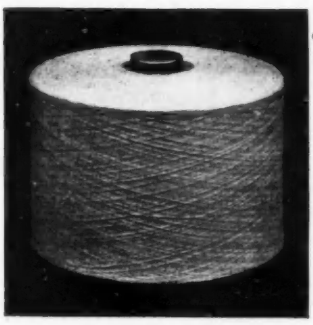


SPECIALISTS IN WINDING, DOUBLING AND GASSING MACHINERY;

for the WOOLLEN and WORSTED trade



Arunco HIGH SPEED CHEESE WINDER



Produces perfect cross-wound packages of large size at high speed.

Instantaneous stop motion. Runner bowls with braking motion.

Spinning Disc drags. Frames arranged with built-in Motor.

ARUNDEL COULTHARD
AND COMPANY LIMITED
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ALSO SPINDLES, RINGS, ETC., FOR THE SPINNING AND DOUBLING TRADE

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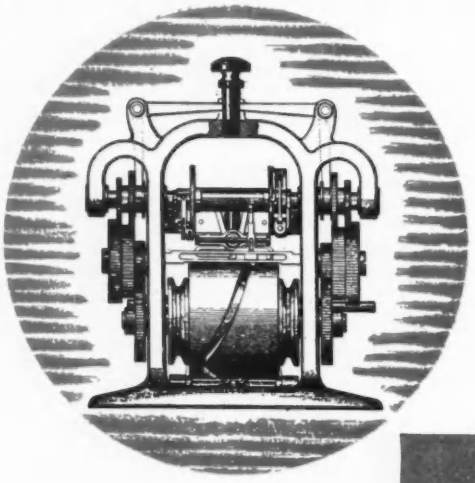
ORIGINATORS IN 1891



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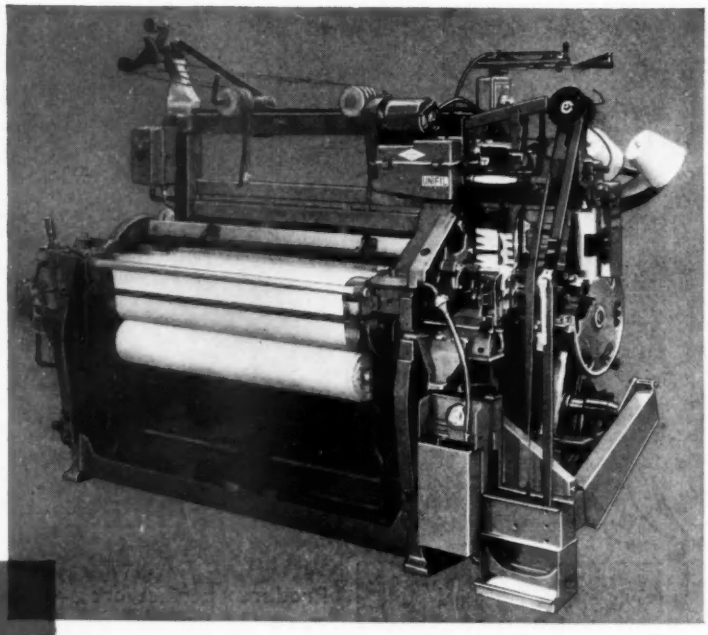

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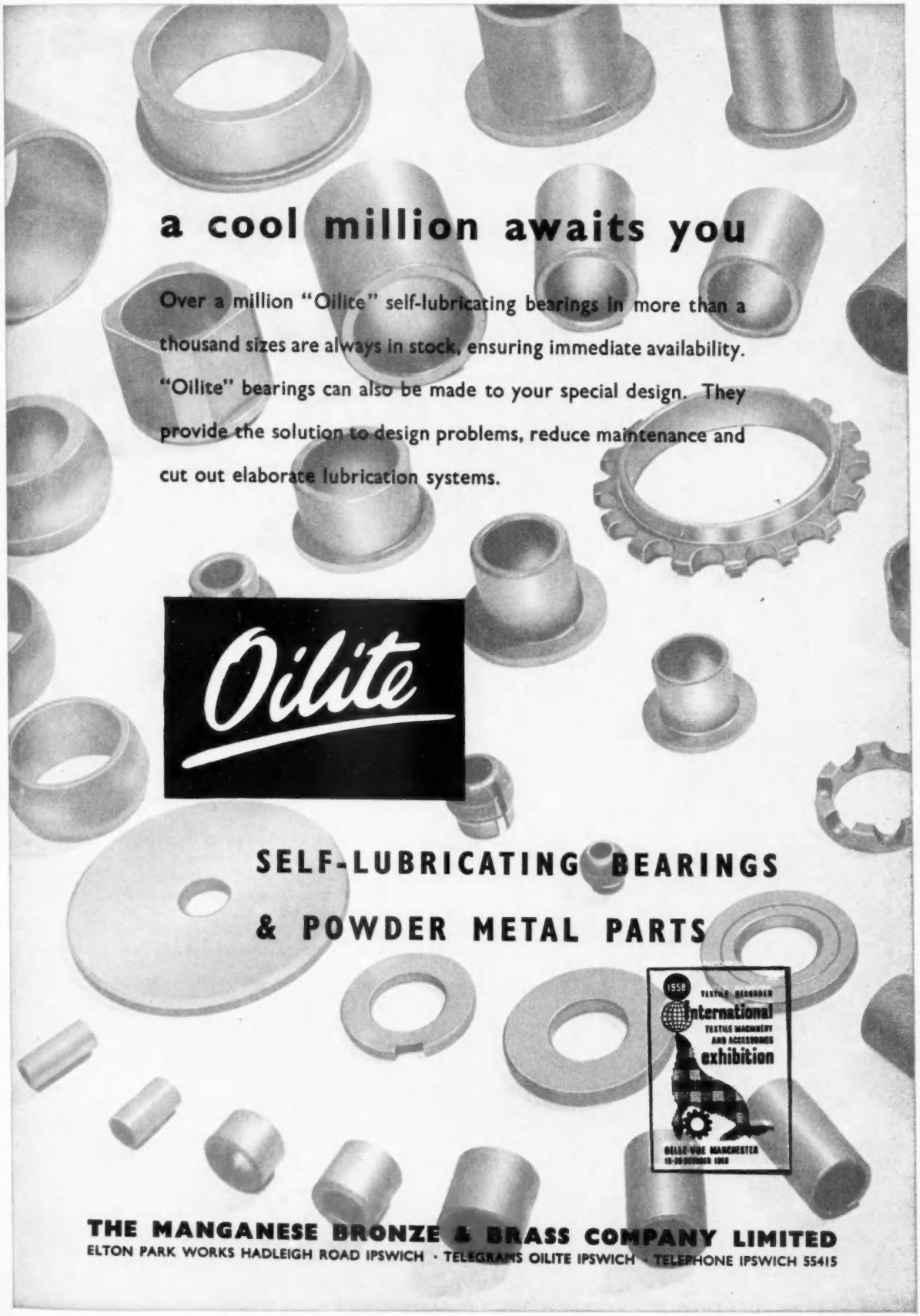
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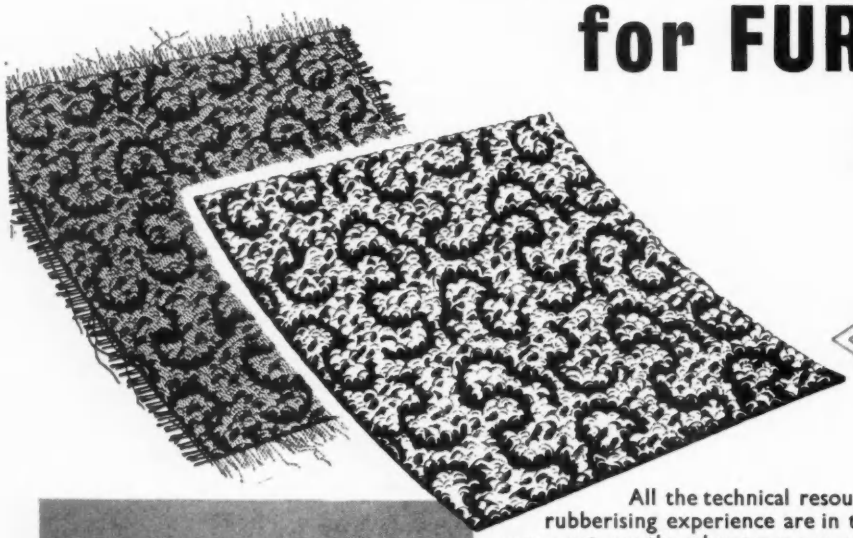

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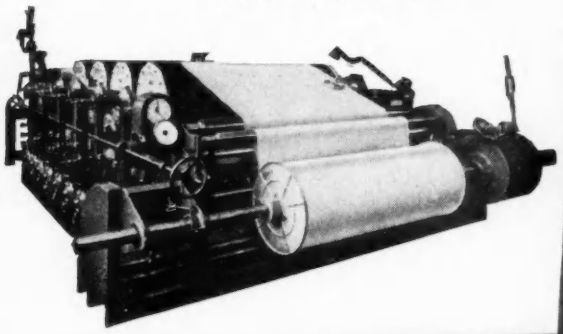
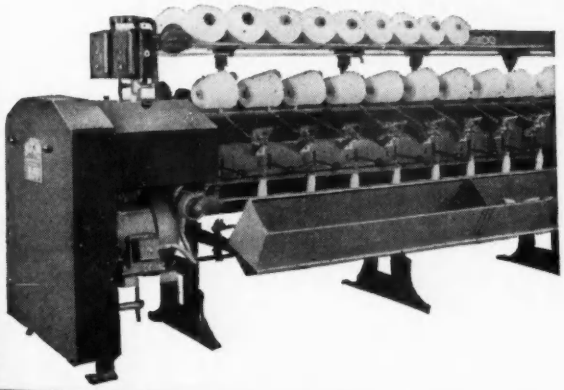
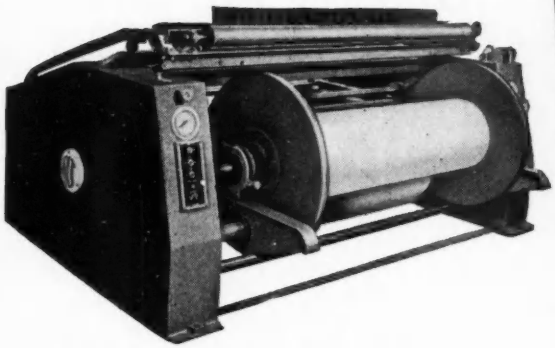
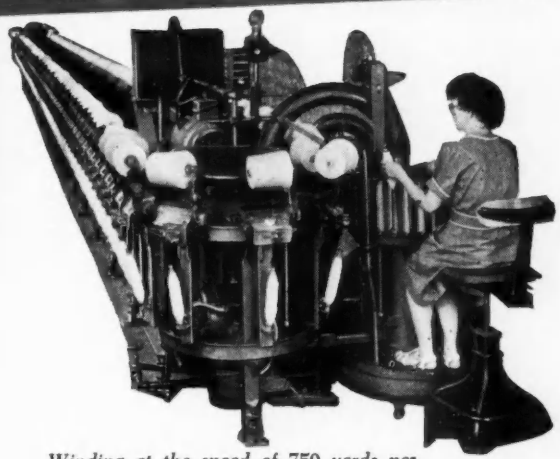


Model 'M86' High Speed Cone or Cheese Winding Machine for perfect packages. Deals alike with all spun yarns in any count or quality.





No. 7 High Speed Beam Warping Machine. Capable of warping speeds up to 1,000 yards per minute. Infinite variable speed, hydraulic beam pressure control, hydraulic beam doffing, ultra-rapid braking system, and simple duplicate controls.



Winding at the speed of 750 yards per minute, the Model 'U' Automatic Travelling Spindle Cone and Cheese Winding Machine increases operative production by 300 per cent.

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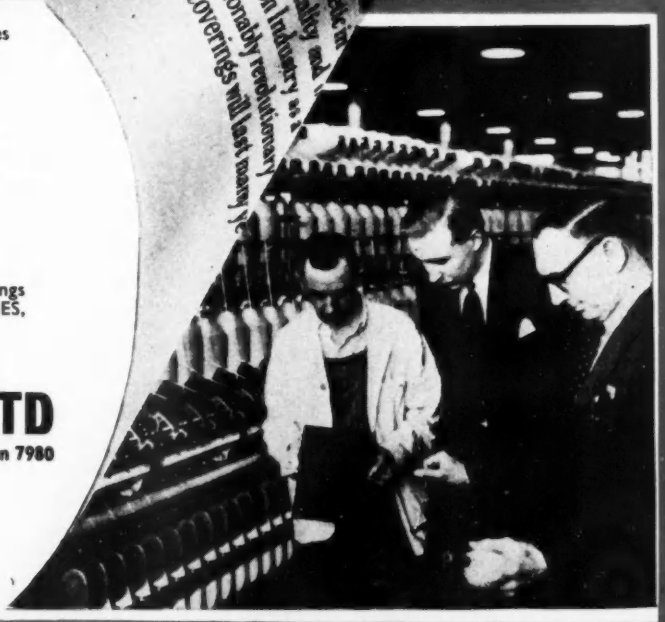

Yarn produced on Tico covered rollers stands up to expert examination. *(Photo by courtesy of Rugby Mill Ltd., Chadderton)*

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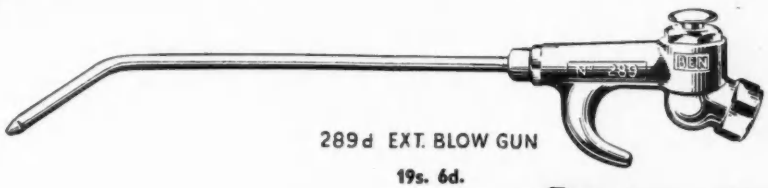

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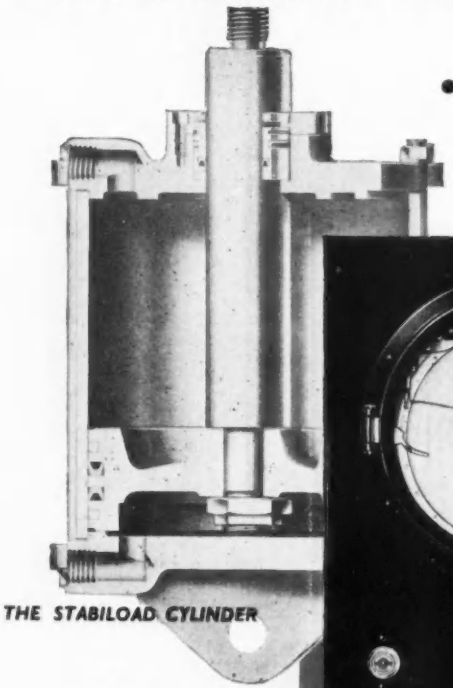

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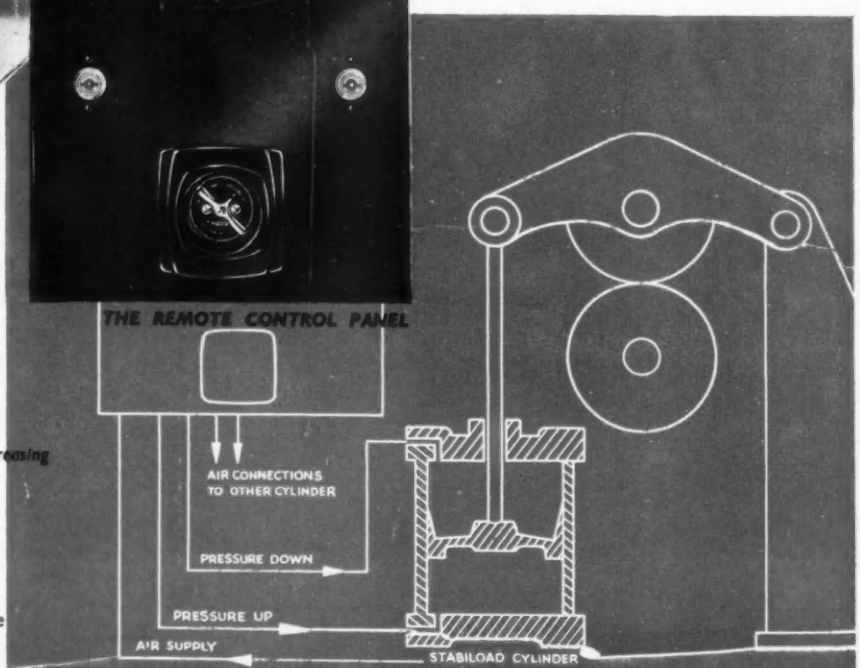

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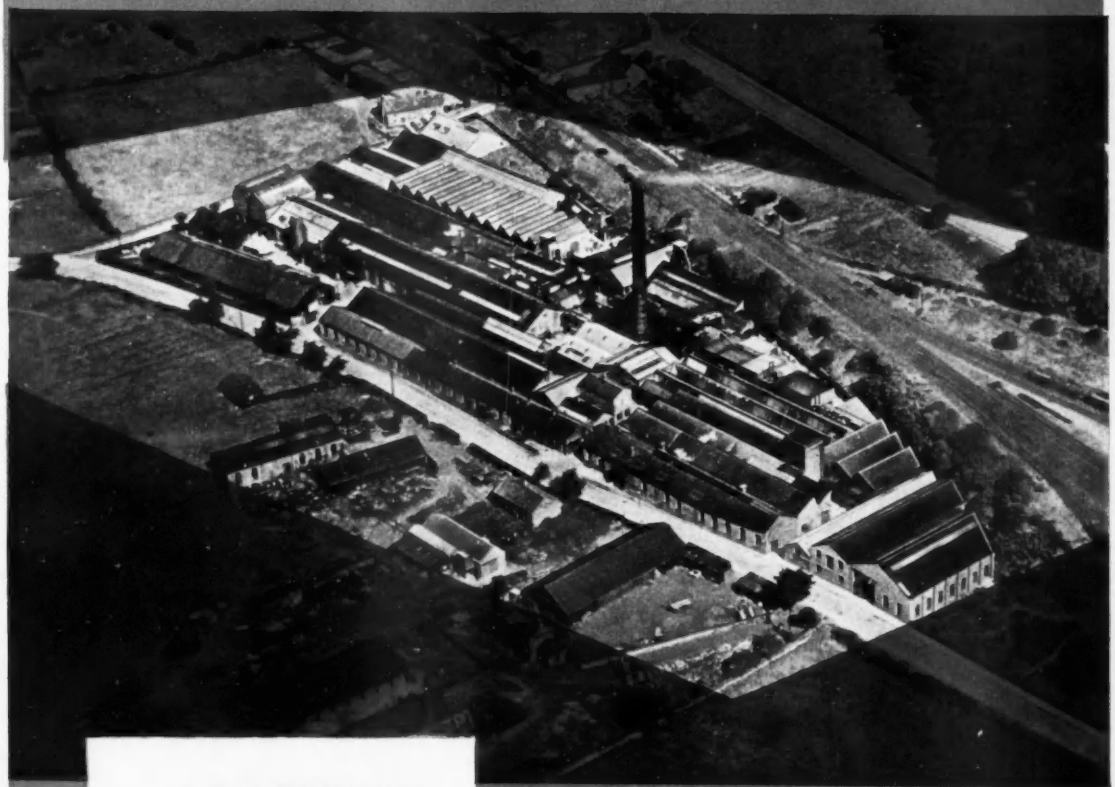

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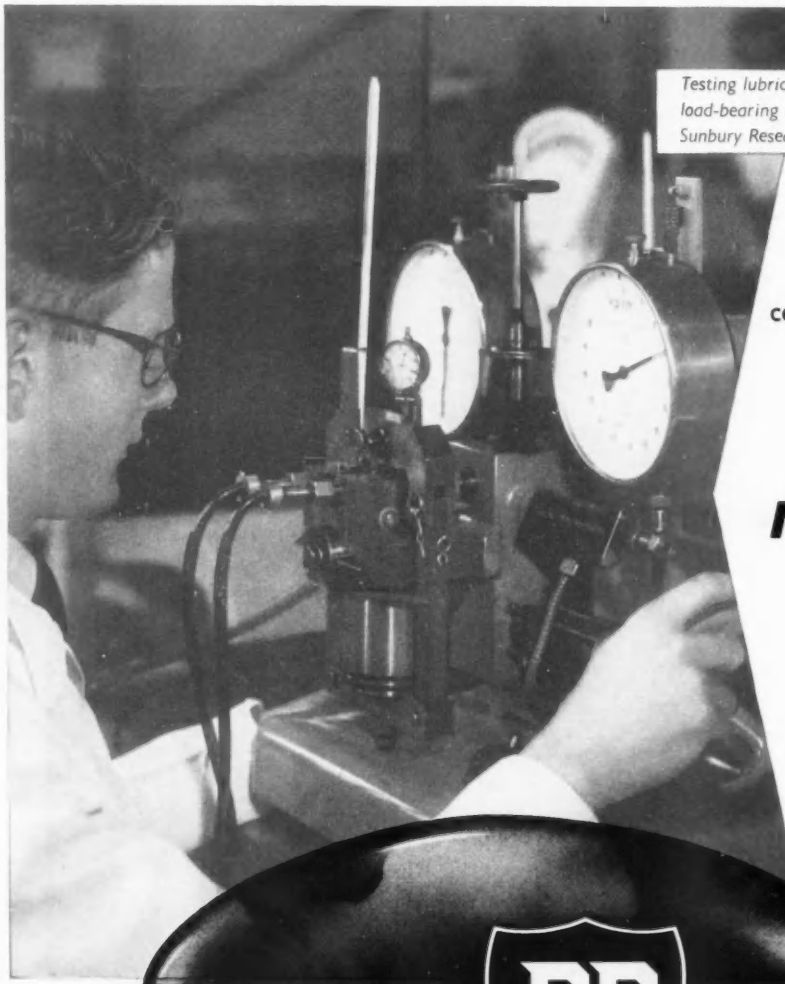

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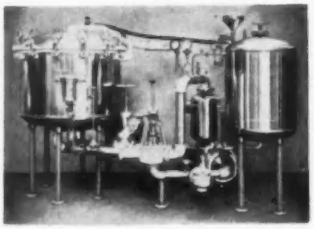
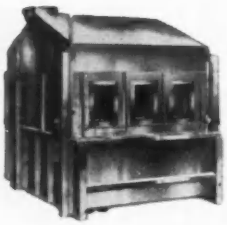
DYEING AND FINISHING MACHINES



PRESSURE DYEING MACHINES

A complete range of machines for dyeing all types of fibre in every stage of manufacture including loose, top, beam, hank and package forms. Also rapid package dyeing machines.

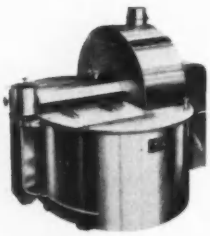


FABRIC AND PIECE GOODS

Machines available in several capacities for dyeing knitted fabrics, silk or rayon and woollen or worsted piece goods in rope form.

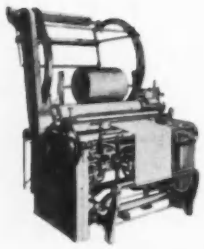
PADDLE DYEING MACHINES

Totally enclosed rotating drum machine for dyeing nylon, pure silk, rayon and cotton hose with perfect penetration and uniformity. Stainless steel in 25, 50, 100, and 200 lbs. capacities.



ROTARY DYEING MACHINES

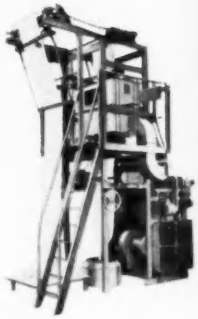
A versatile machine in stainless steel for ladies' hose, half-hose and loose articles. Also used for anti-shrink and bleaching. 4 capacities from 12-200 lbs



CALENDERS

Medium type in 2 sizes with single or twin feed for finished fabric widths up to 59". Light type and continuous blanket heavy type Calenders are also available.

PEGG

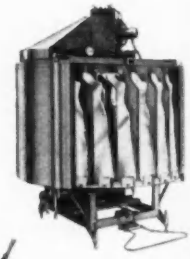


FABRIC DRYING MACHINES

The Pegg-Pasold machine for continuous drying of all circular and warp knitted fabrics in a relaxed condition.

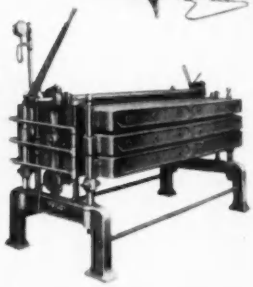
FABRIC FINISHING MACHINES

The Bromac machine imparts a luxury finish to knitted fabrics. Automatic for finished widths up to 33".



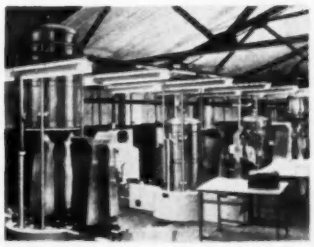
HOSE FINISHING MACHINES

Forms move through circular drying chamber at low temperature to ensure perfect matt finish, to nylon hose.



PRESSES

3 and 2 bed presses for finishing all classes of hose, half-hose and similar articles.



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This new machine with 96 forms enables 4 sizes or types of hose to be processed without risk of mixing, speeds up output and gives greater time and temperature control.

Builders of dyeing machines for loose stock, hanks, packages, piece- goods, fabric and hose ; also finishing machines for all classes of circular knitted and warp loom fabrics and garments. Pre-boarding and finishing machines for nylon hose.

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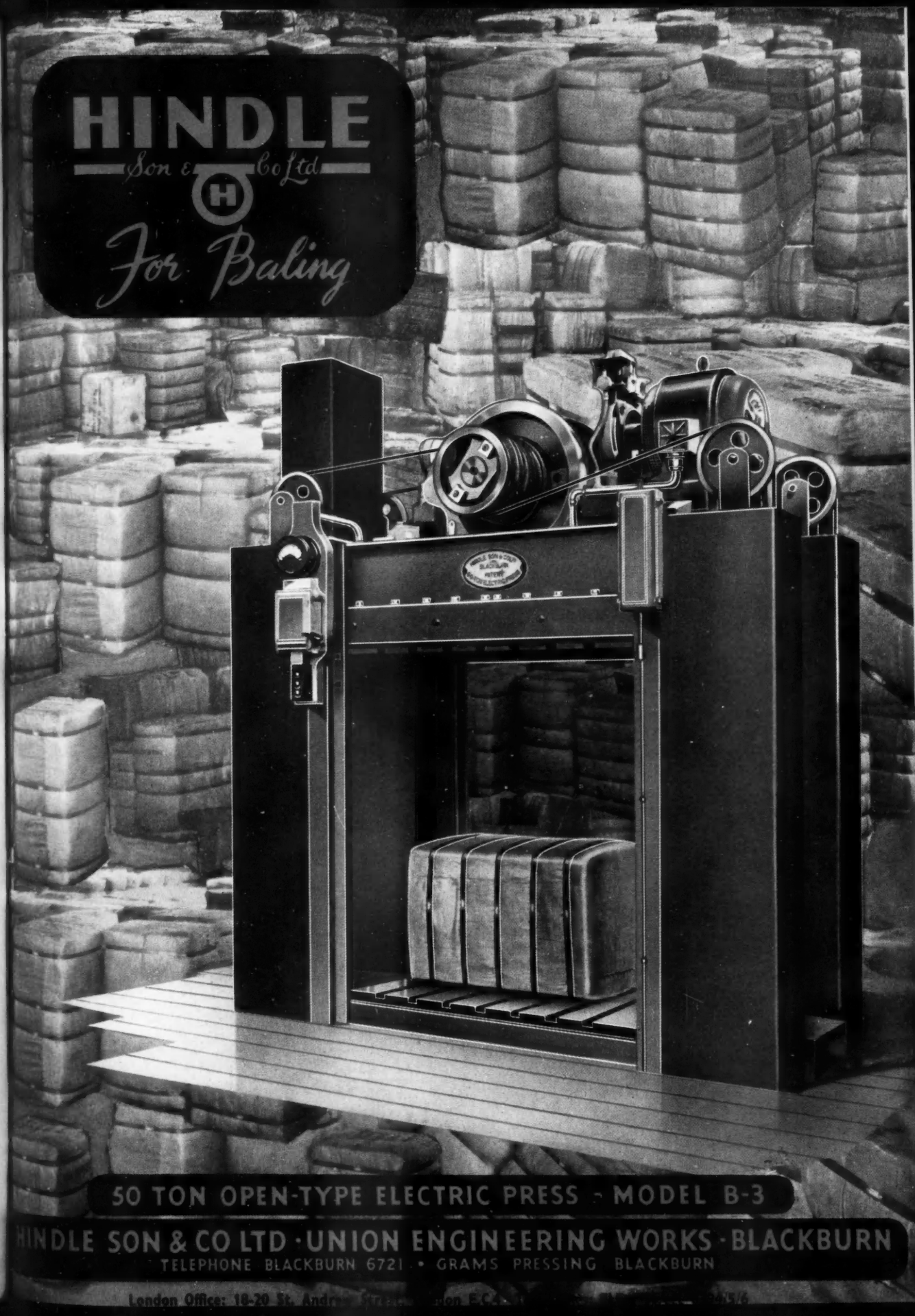
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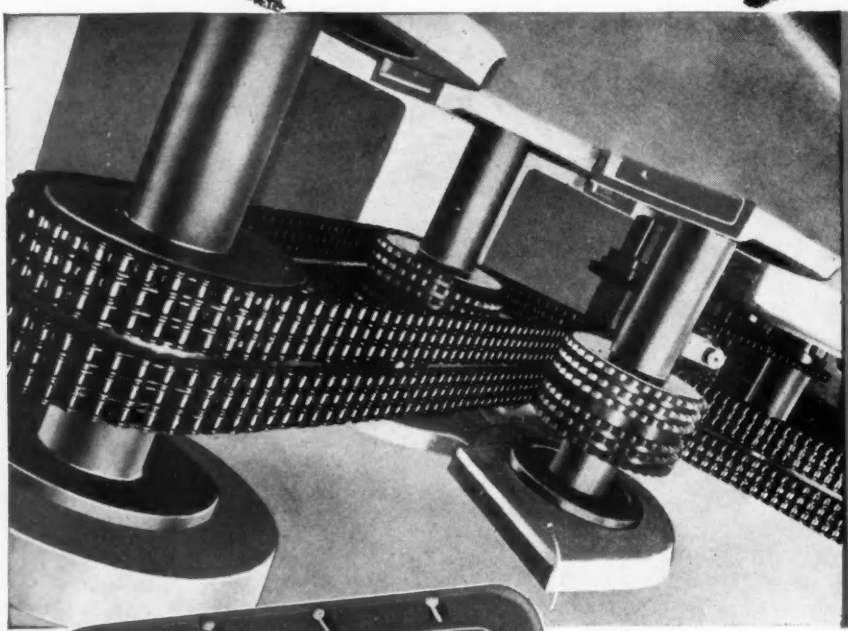
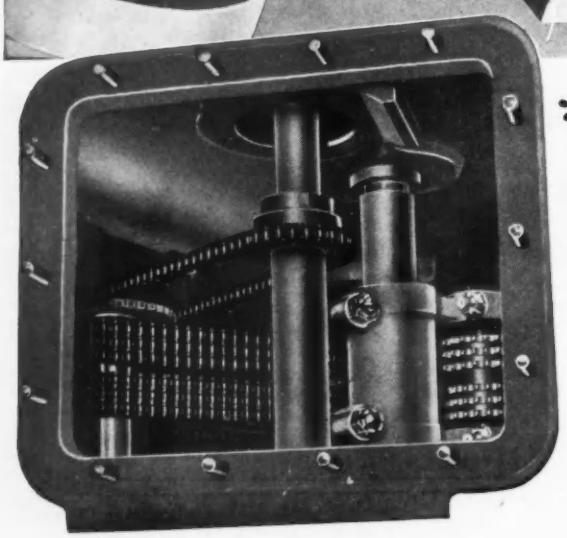
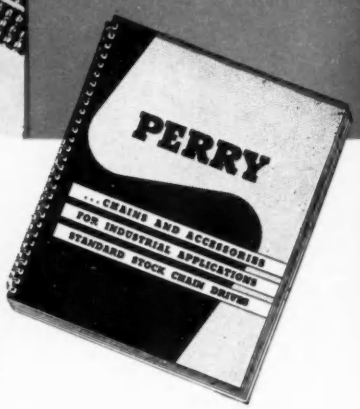


These photographs illustrate Perry multi-strand chain drives as used extensively by British Nylon Spinners Limited. For long and *consistently* reliable service it pays to specify Perry. Let our technicians help to solve *your* chain drive problem. Your enquiry will be given immediate and expert attention.





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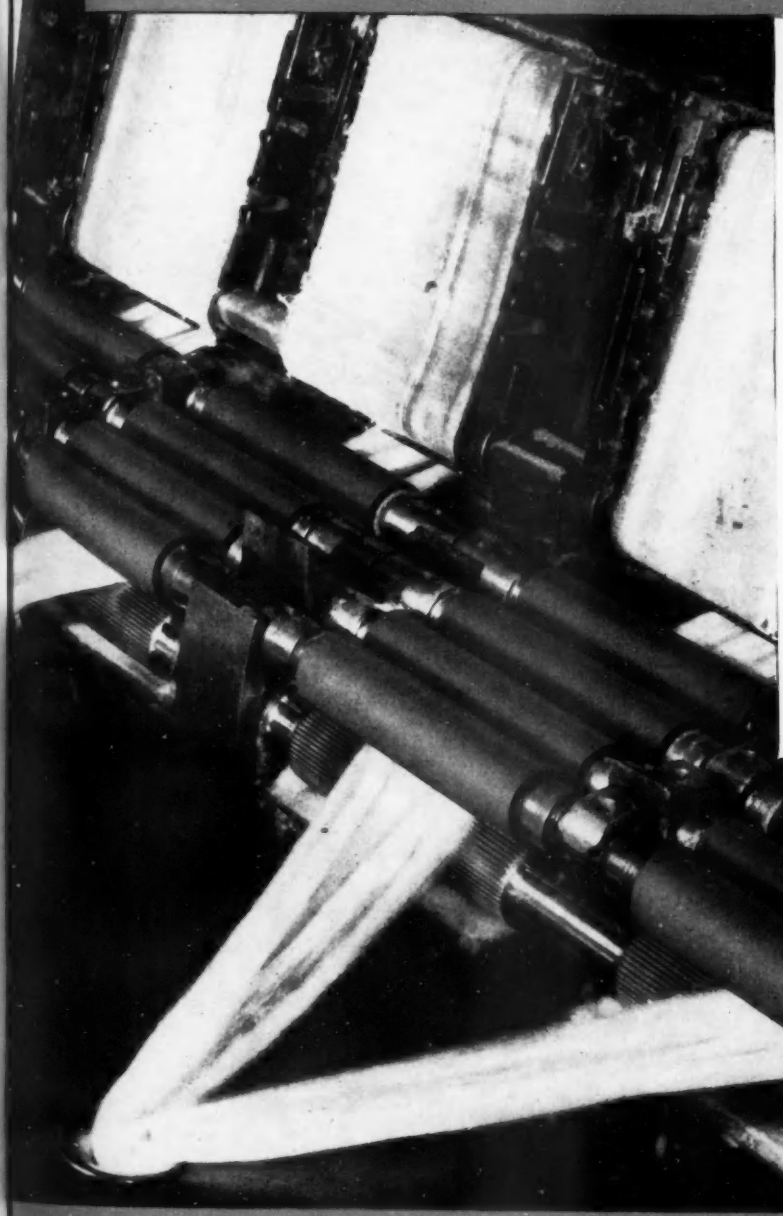
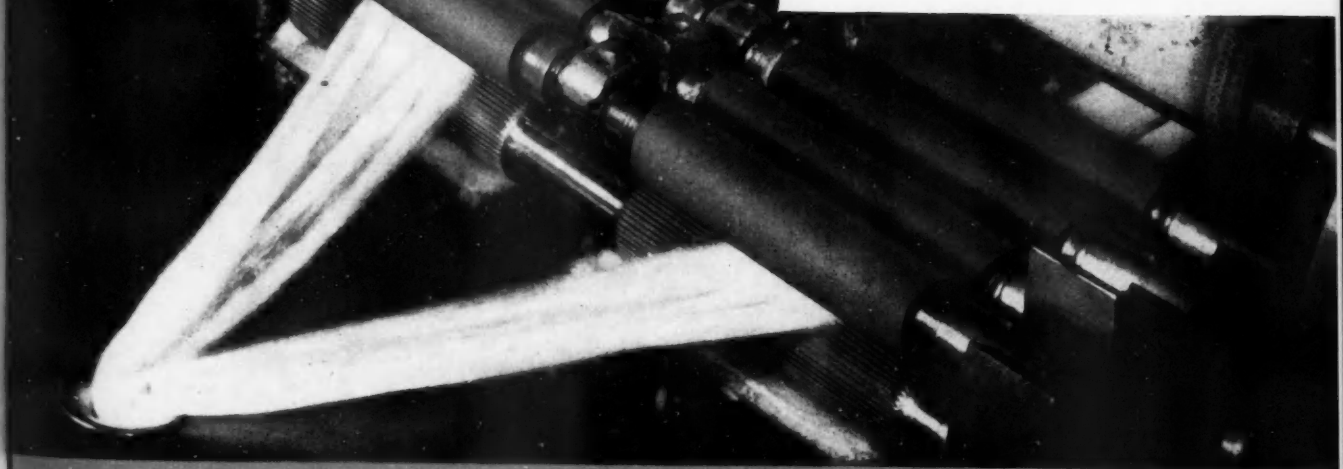


CASE HISTORY No. 5

At this mill the draw frame roller coverings were responsible for a high deviation percentage giving uneven web, the results affecting all subsequent processes. The main disadvantages were thick and thin or uneven lengths of yarn at the mule or ring frame.

Additionally the coverings required periodic varnishing, roller lapped frequently and more quickly due to heavy weighting.

Armstrong CL/S and S/S cots when installed needed no varnishing, required only occasional buffing, did not roller lap, withstood heavy weights and produced the required even web. The cots installed in this mill in 1948 are still running satisfactorily.



Armstrong ACCOTEX* COTS & APRONS

Armstrong Accotex Cots and Aprons give improved drafting for greater yarn regularity and increased wear resistance to withstand synthetic fibres. They possess electrolytic properties which decrease roller laps and by their longer life reduce costs.

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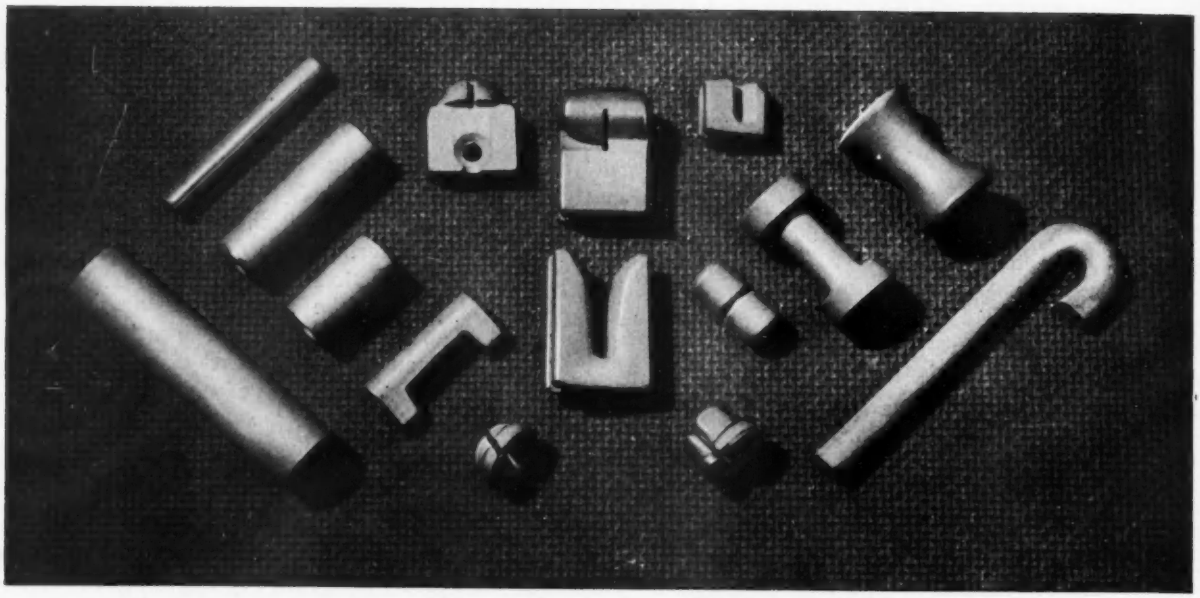

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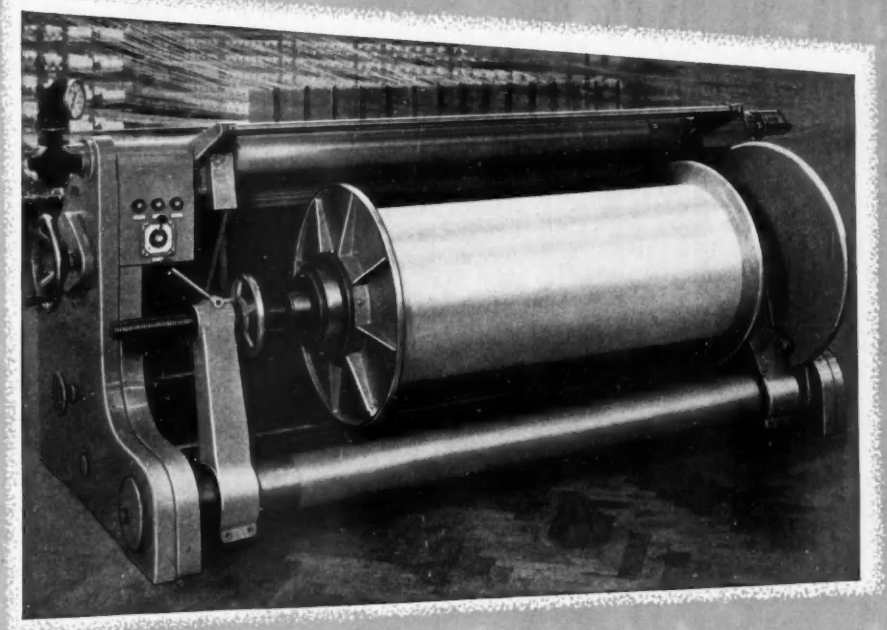

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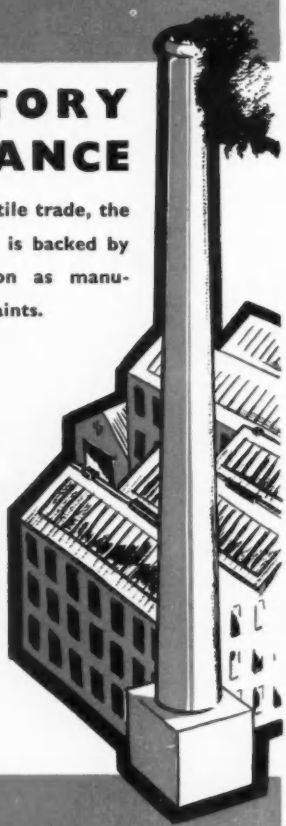

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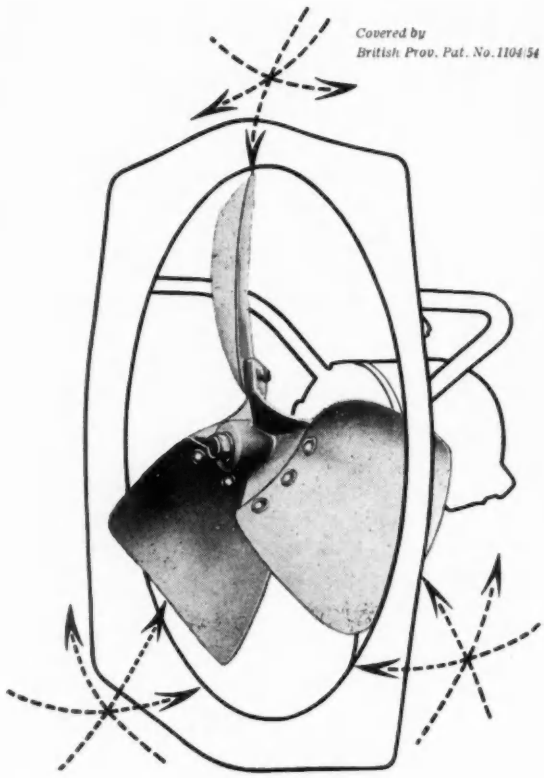

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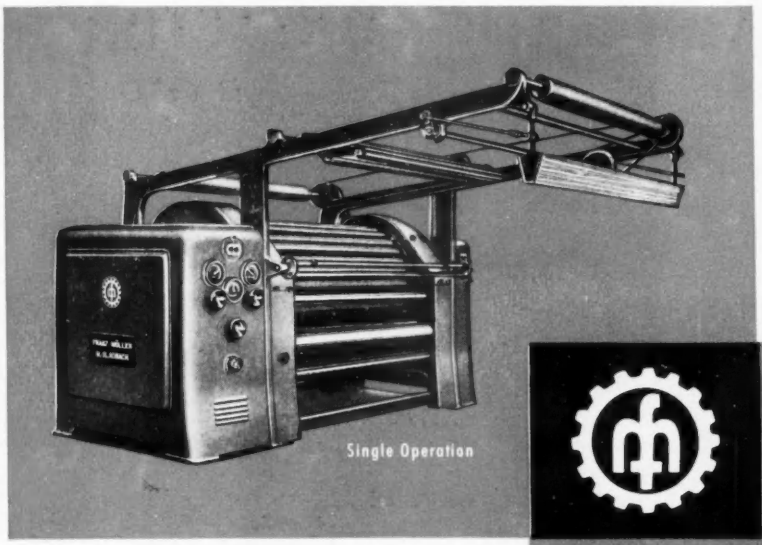

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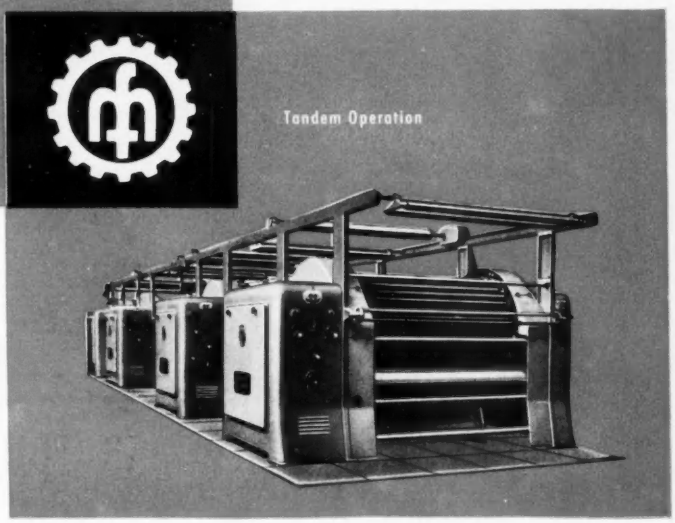

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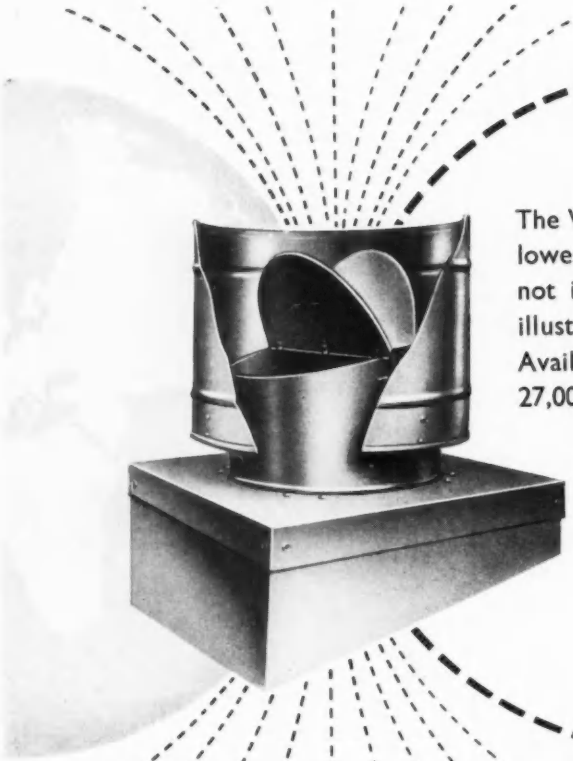

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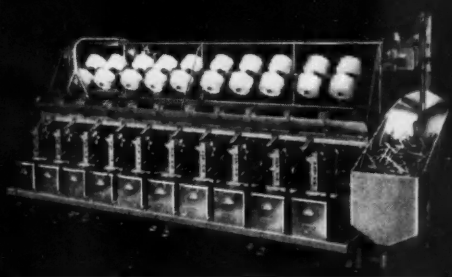
for cotton and spun rayon, speed variable from 8000 to 11000 revs.



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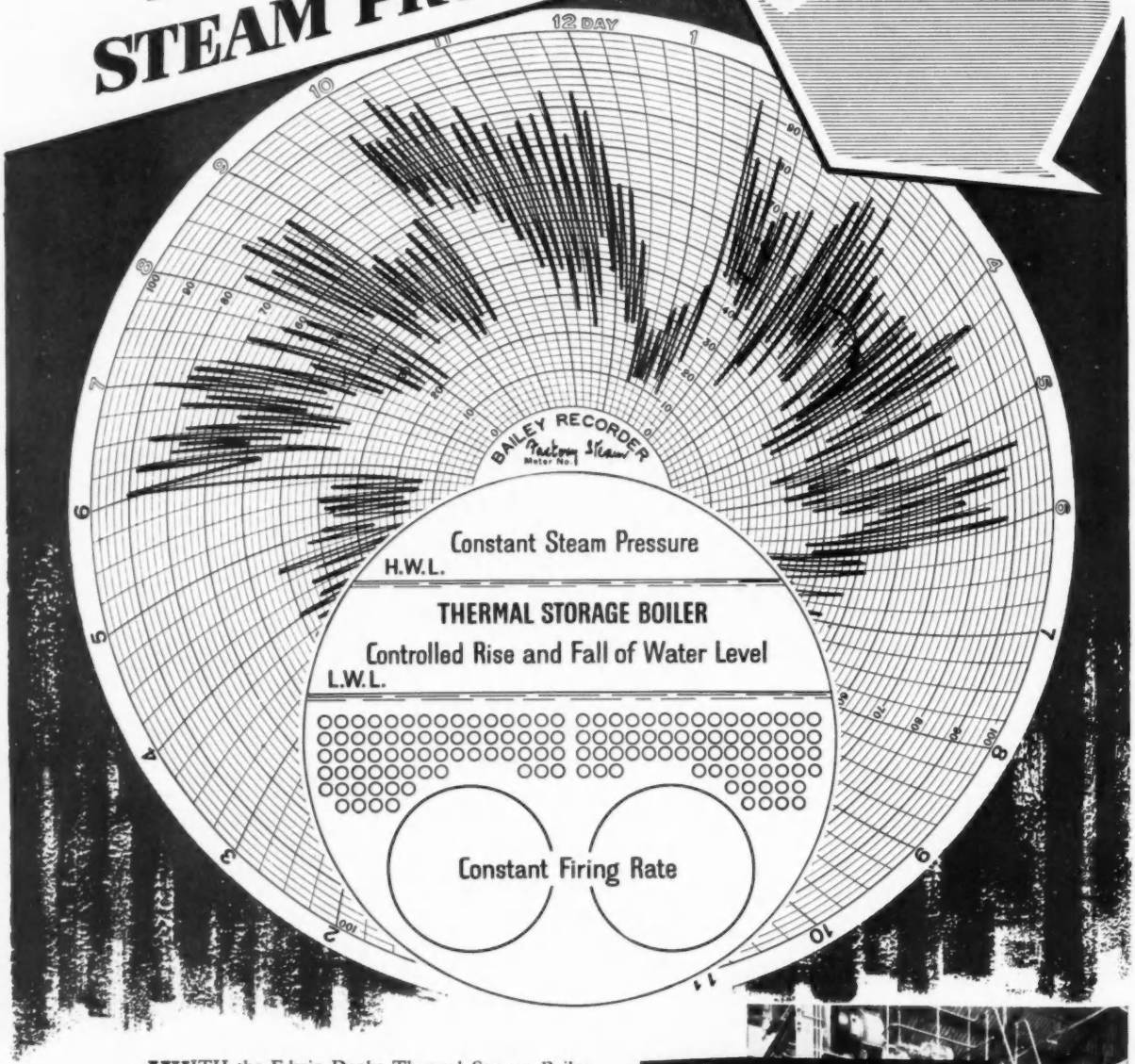

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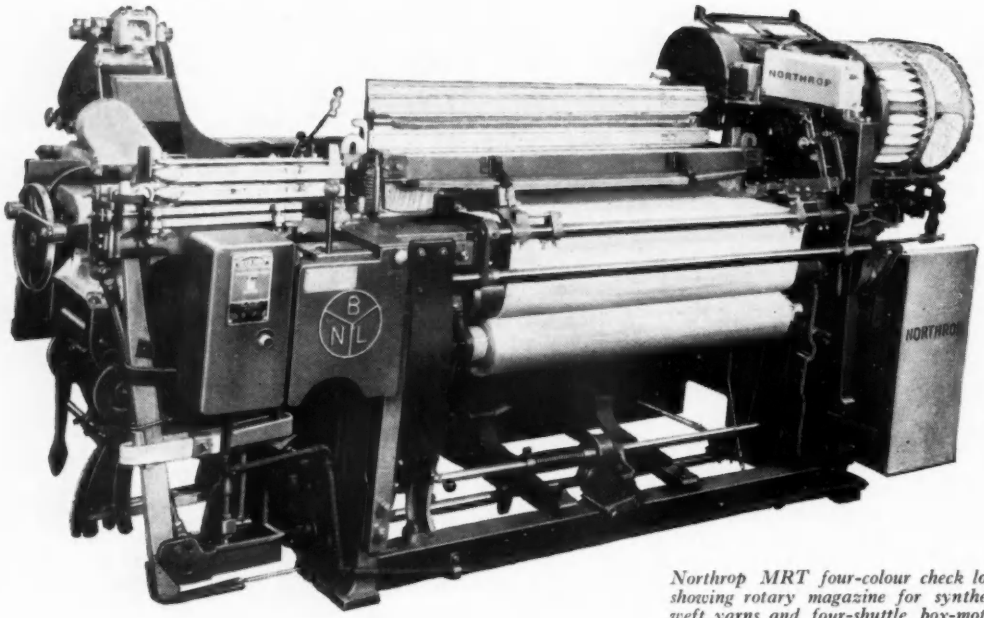

Northrop MRT four-colour check loom showing rotary magazine for synthetic weft yarns and four-shuttle box-motion controlled by Gohed three-barrel card-motion.

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MRT MODEL LOOM

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THE NORTHROP MRT MODEL LOOM a low-built, topless, all-purpose loom, convertible from single shuttle to 2-box check, or 4-box check, or 2-box continuous weft-mixing.

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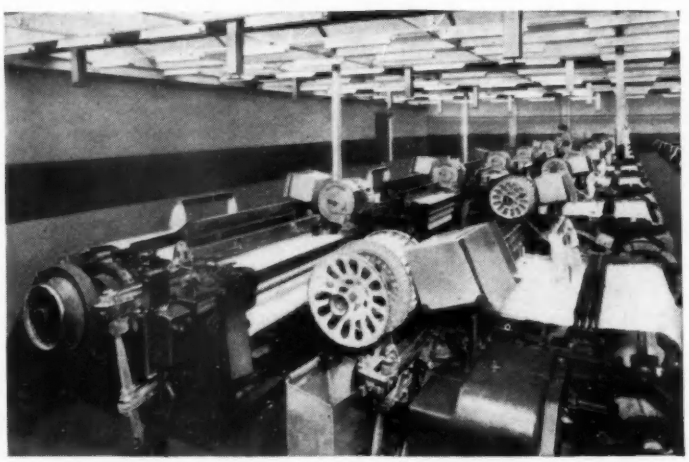

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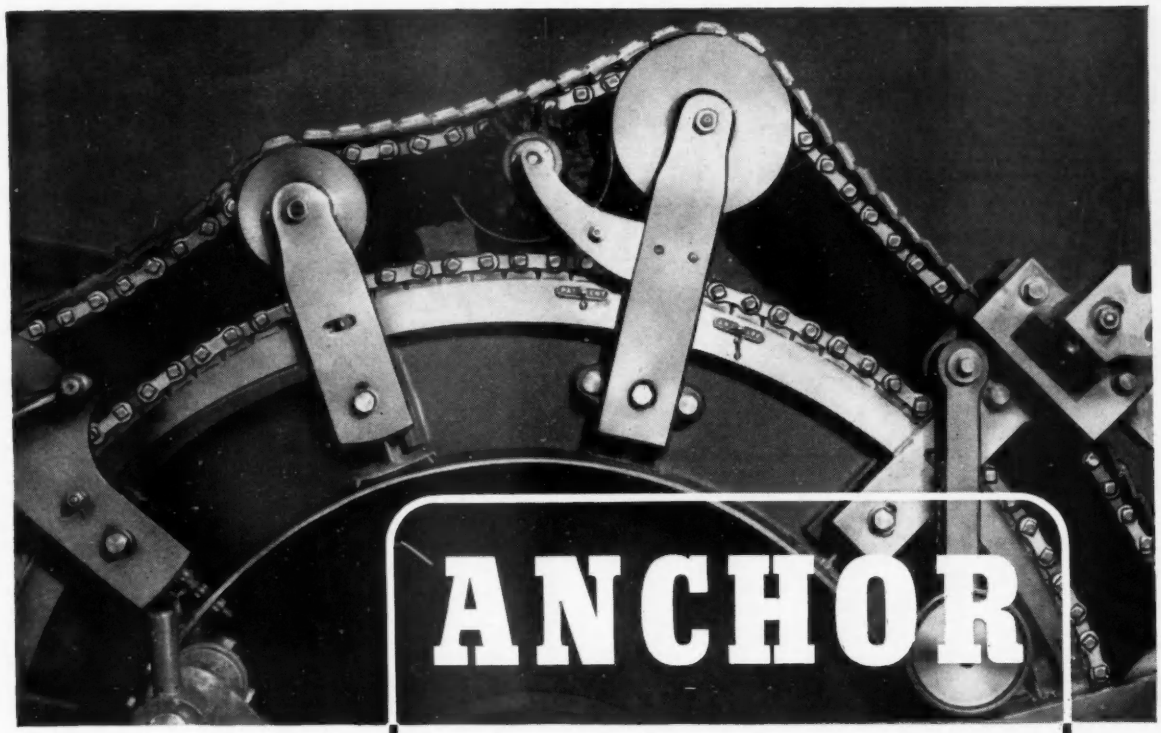

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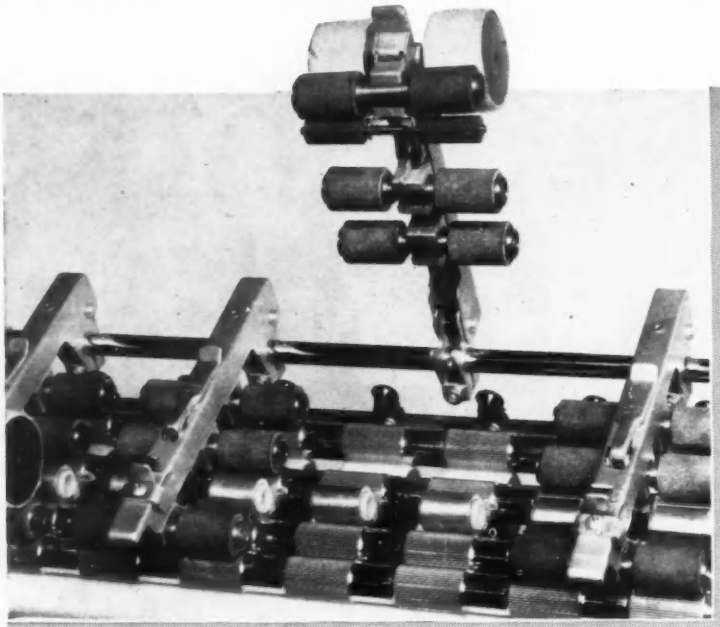
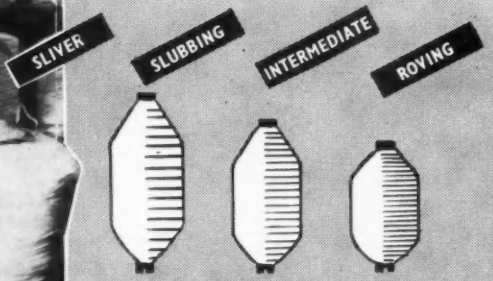
for FINE - MEDIUM and COARSE counts



A certain method of improving yarn quality from . . .



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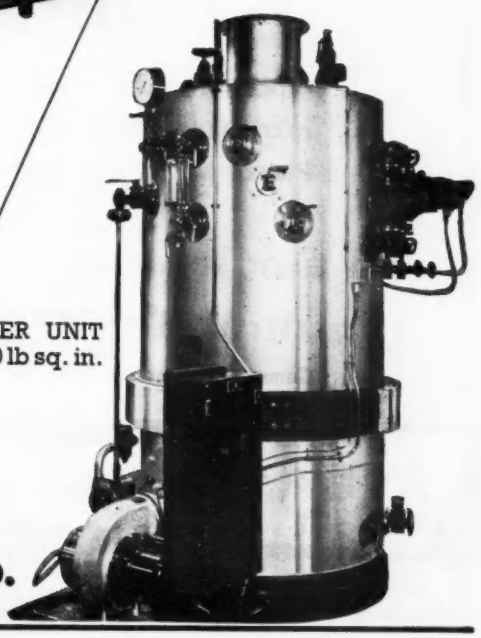

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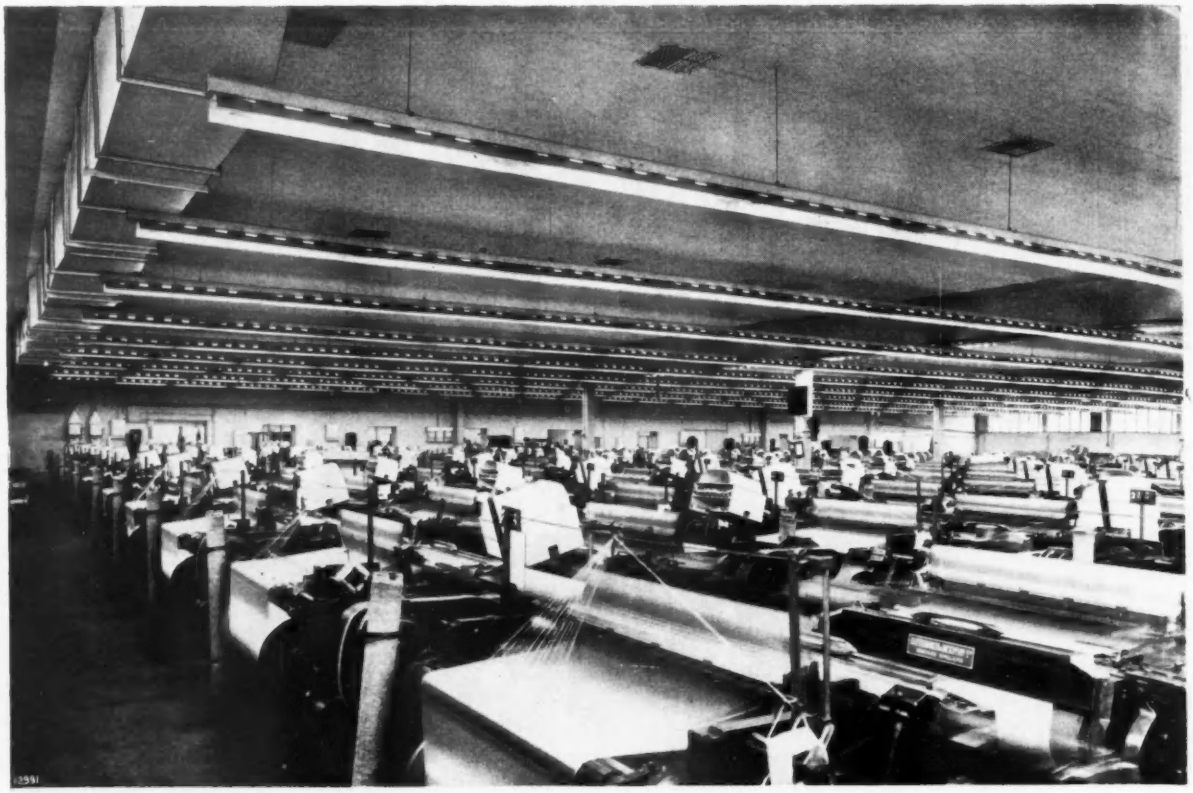

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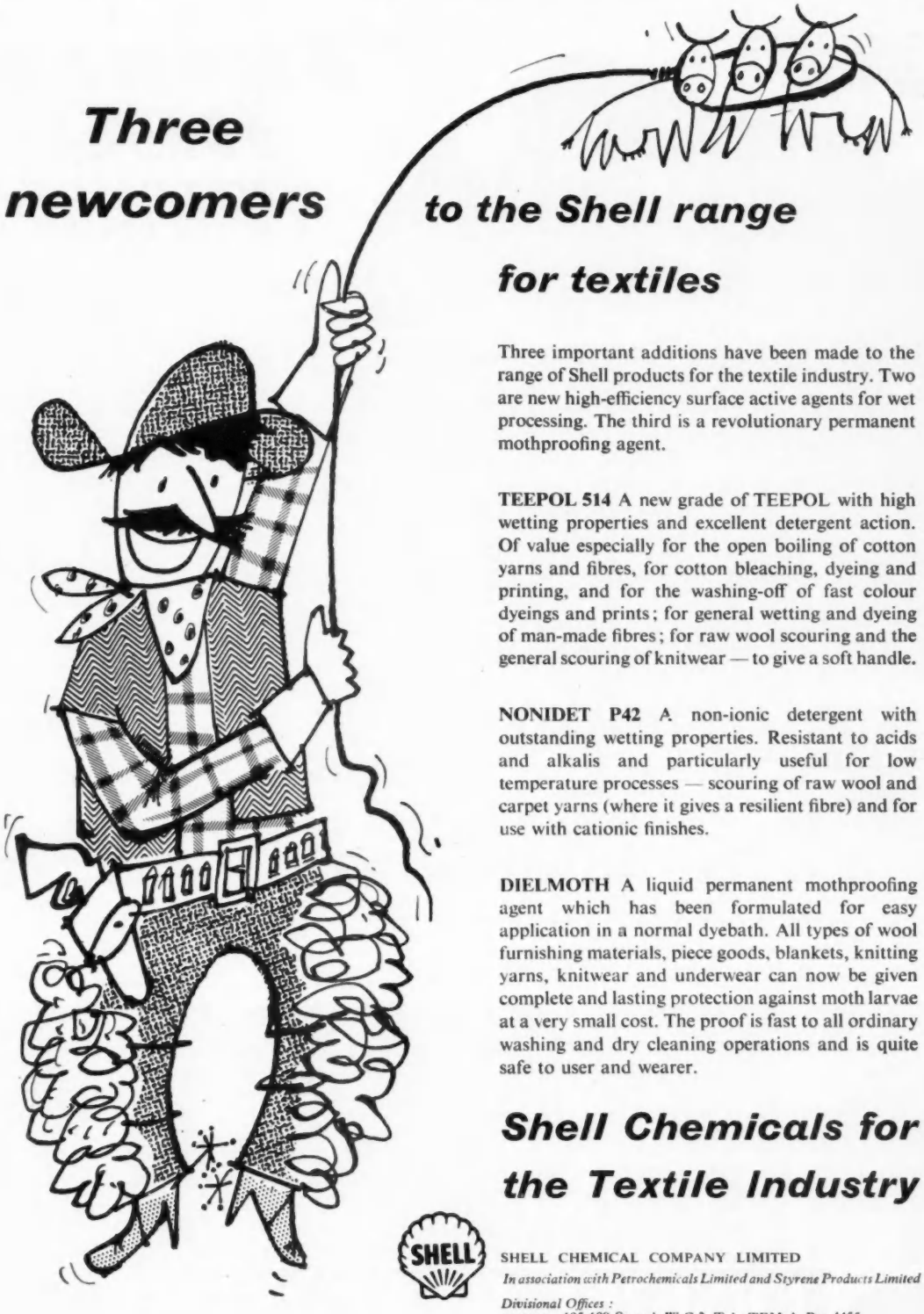

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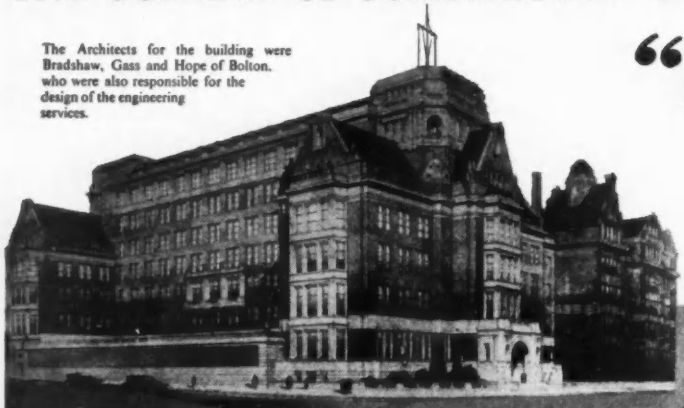

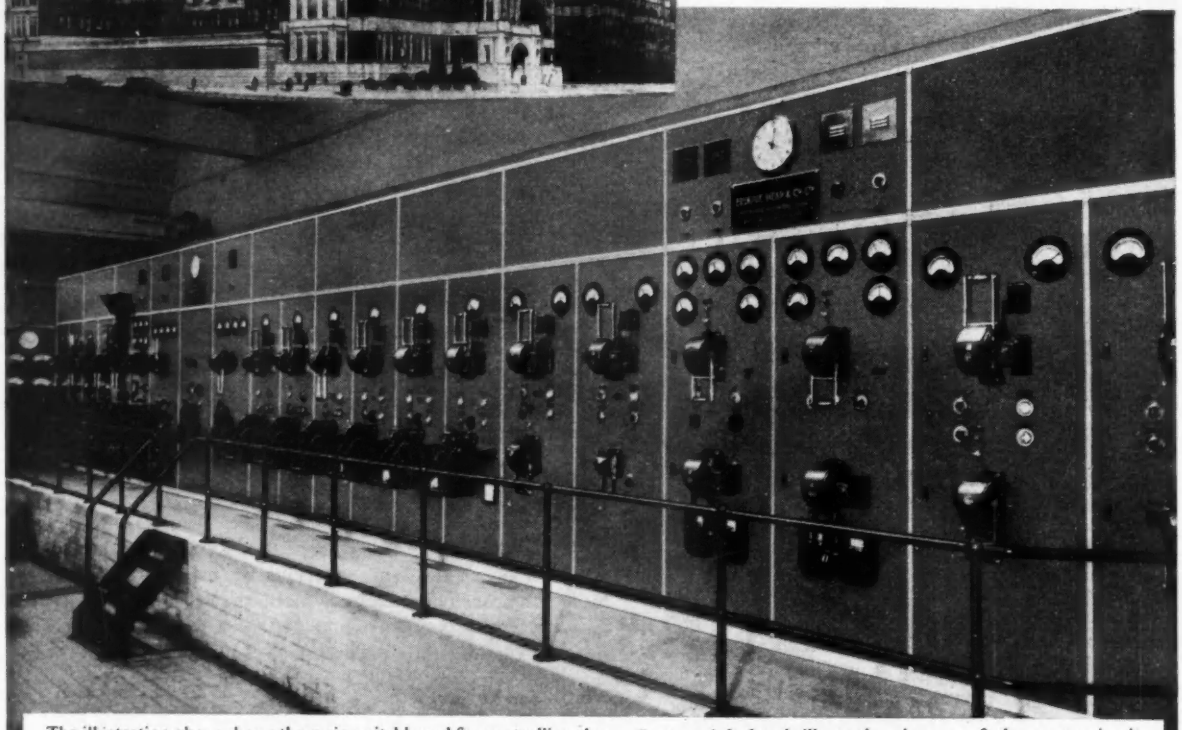

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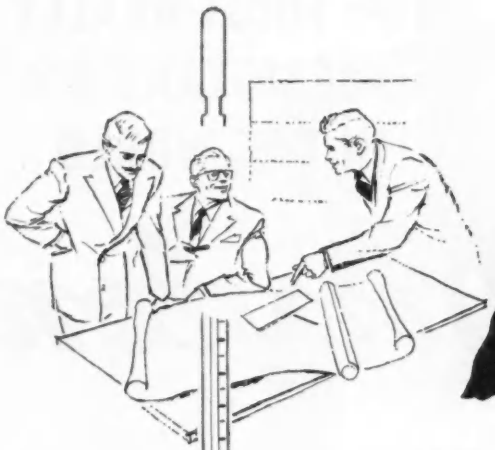

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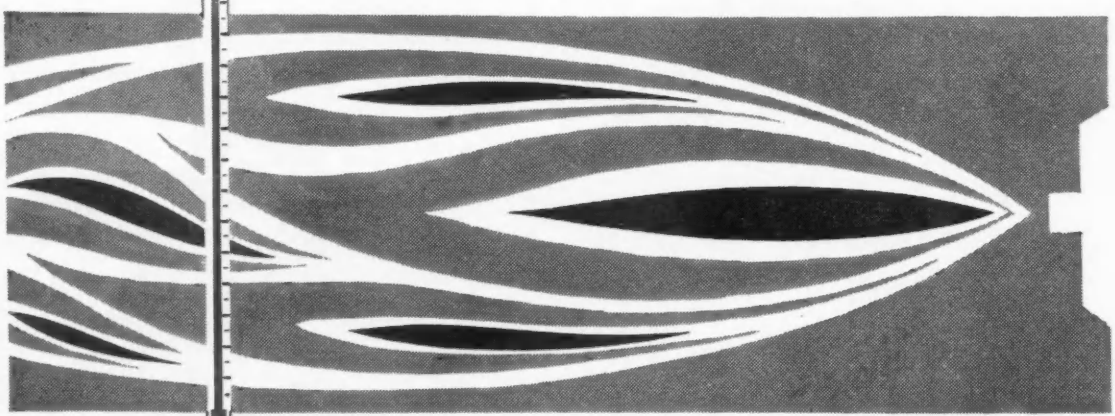

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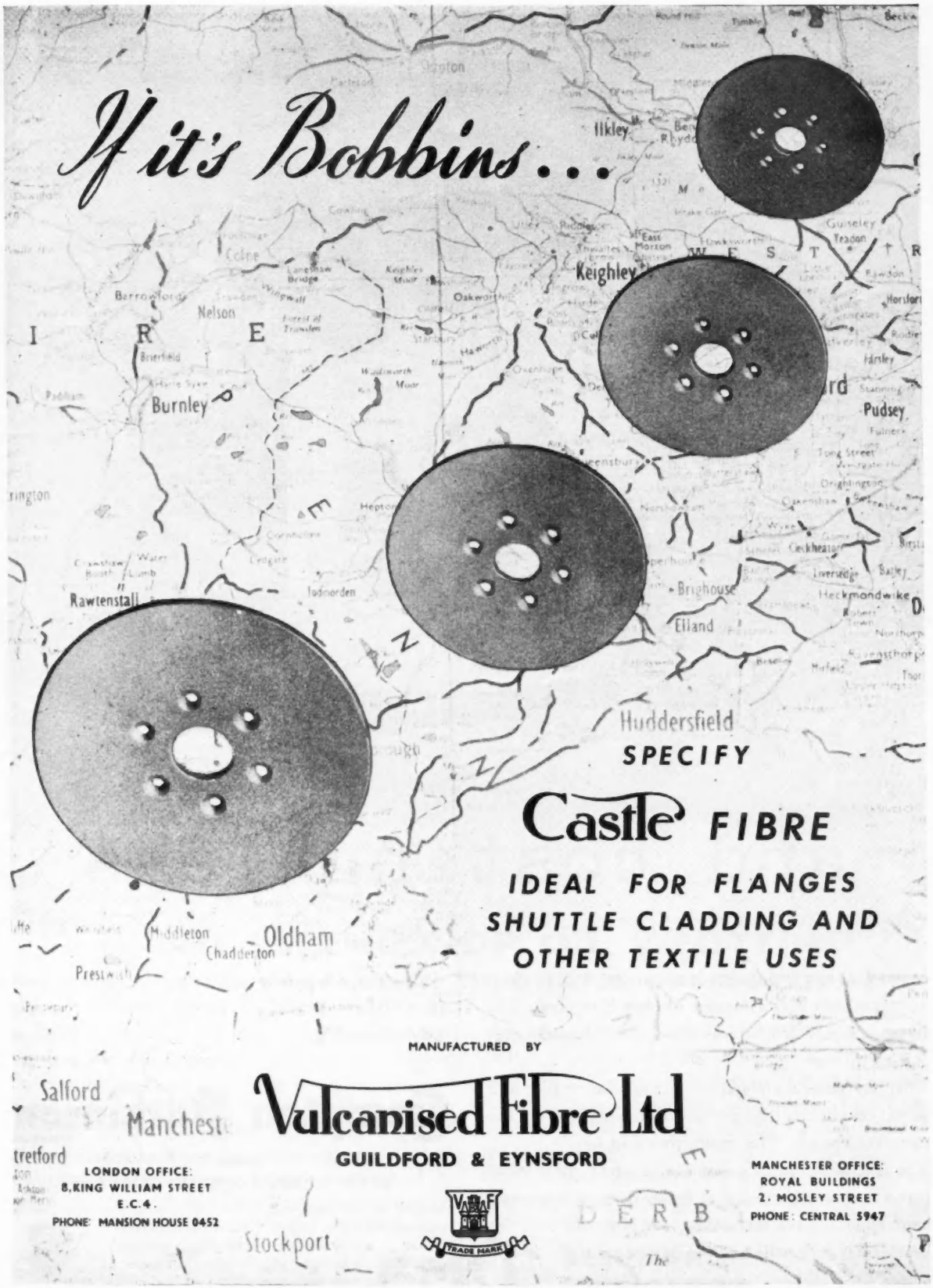

MANUFACTURERS OF 'CASTLE' VULCANISED FIBRE, SHEETS, RODS, TUBES, LEATHEROID, CONTAINERS AND COMPONENT PARTS

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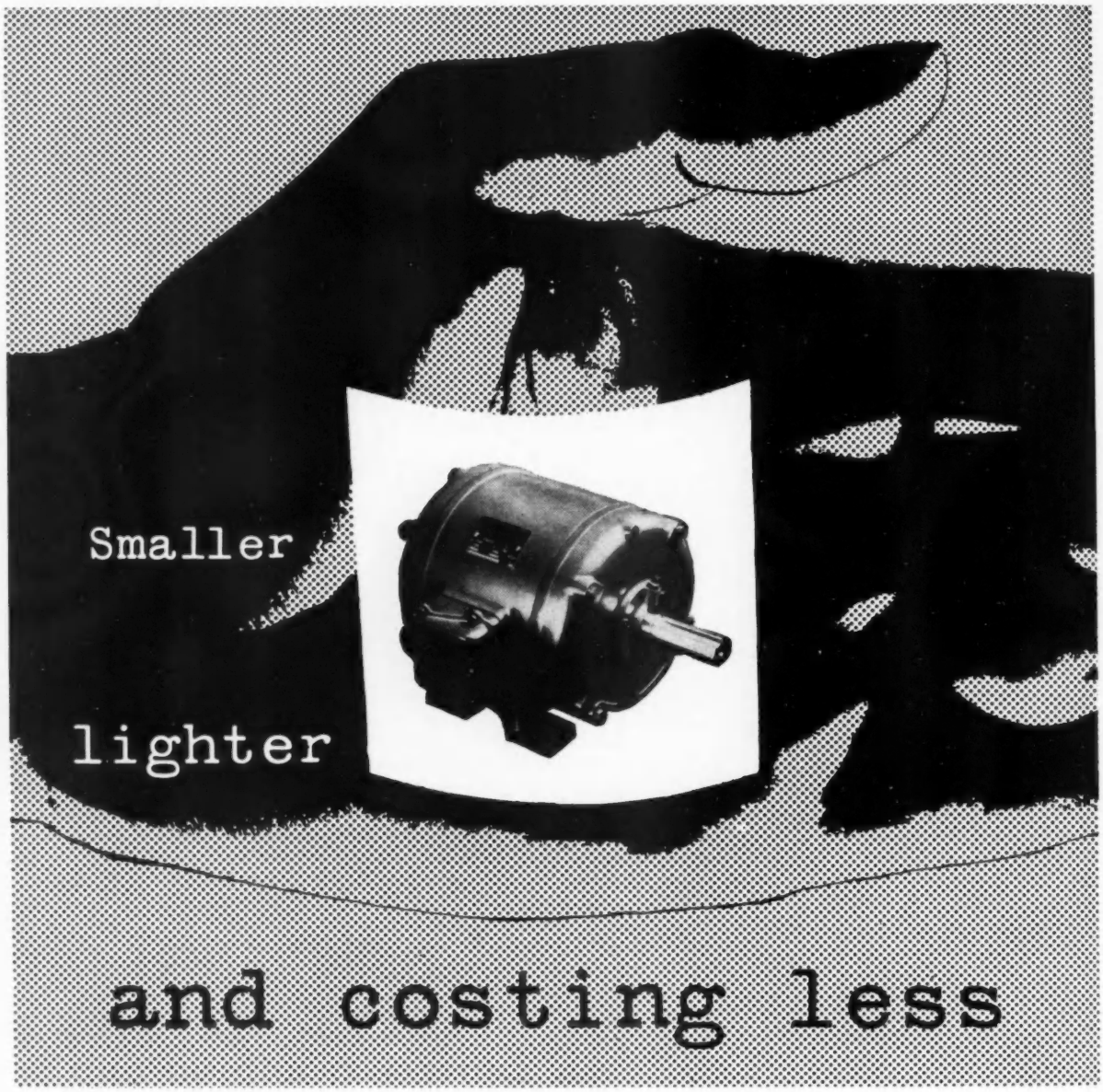

Series 5 motors are designed, electrically, to B.S. 2613: 1957, and take full advantage of class E insulation. In frame size and mechanical details they comply with B.S.2960: 1958.

They are generally about one frame size smaller and 40 per cent lighter than previous standard motors of the same horsepower. This means they cost less.

The enclosure is drip-proof and gives mechanical protection superior to that of earlier designs. Improved ventilation ensures that cooling air is drawn over the bearings at *both* ends and discharged centrally at low velocity.

Although entirely new in design, these motors benefit in countless details of manufacture by the long experience of . . .

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MAKERS OF ELECTRIC MOTORS OF ALL KINDS · ALTERNATORS & GENERATORS · SWITCHGEAR · B.E.T. TRANSFORMERS CABLES · INSTRUMENTS · LAMPS · LIGHTING EQUIPMENT · BATTERIES · STUD WELDING EQUIPMENT TRACTION EQUIPMENT · CEILING FANS

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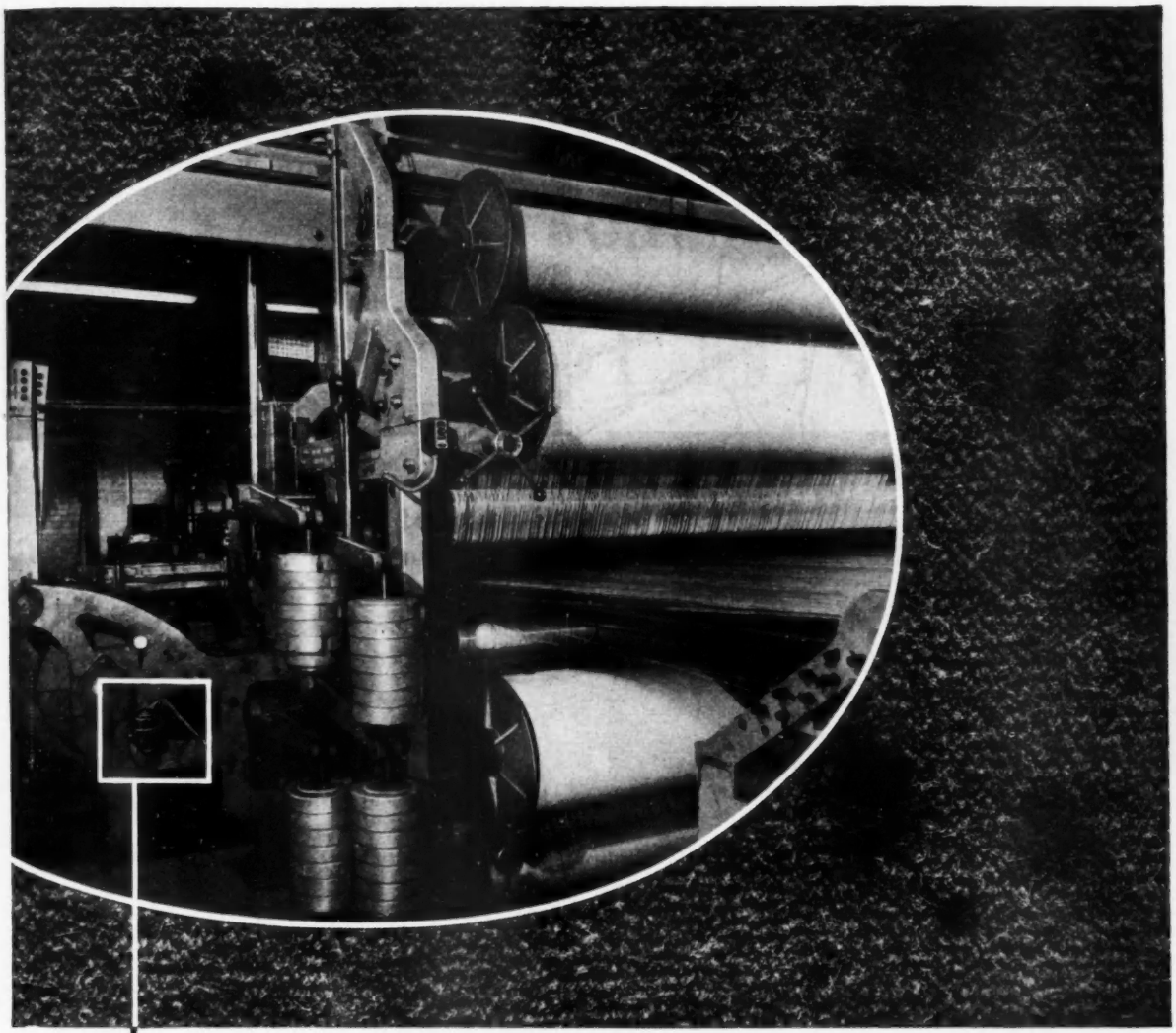


At the works of Messrs. Wilson & Longbottom of Barnsley, this loom weaves Wilton Carpets on the Face-to-Face principle, the pile yarn being cut to separate them. The loom is fitted with a Tecalemit "Bijur" semi-automatic Lubricating System.

NO CHANCE OF OIL SPOTTING

WITH TECALEMIT AUTOMATIC LUBRICATION

Tecalemit Automatic Lubrication has now replaced old-fashioned, messy, oiling methods on many textile machines. On this intricate carpet loom there are 75 oiling points to which oil is metered cleanly and efficiently, by the Tecalemit "Bijur" System. Each point receives at regulated intervals the exact quantity of oil needed.

Every bearing and friction point is maintained at its full efficiency, unproductive stoppages for hand lubrication are unnecessary, and spoilage of valuable carpeting by oil spotting is avoided.

The "Bijur" System — one of several Tecalemit Systems — may be entirely automatic or controlled by a single hand pump. It is particularly suitable for many types of textile machinery.

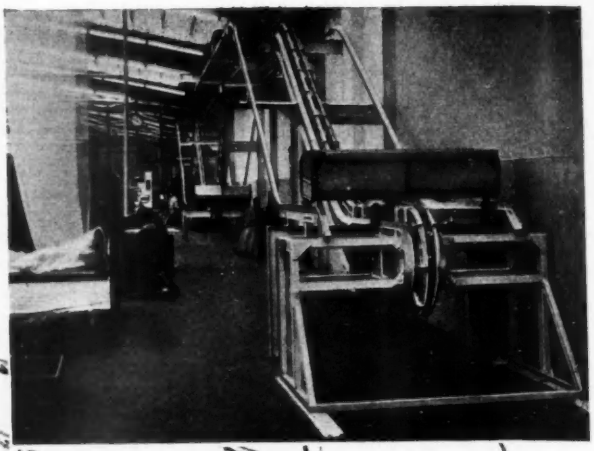
Our Technical Department will be glad to advise on the type of system most suited to your needs.

TECALEMIT **AUTOMATIC LUBRICATION**

TECALEMIT LIMITED · PLYMOUTH · DEVON

T 608

Teleflex conveyor system installed at Hollands-Zwitersche Borduurfabriek Egger N.V. Almelo. The system comprises a Universal Overhead Conveyor for the transport of cotton goods with automatic discharge.



A comparison between old and new methods. Installation by Teleflex N.V., Rotterdam.

We have the pattern for Handling at our fingertips—

The textile industry is another instance of where Teleflex handling systems are speeding production and reducing costs. Teleflex Mechanical Handling Engineers are called upon to provide many different handling systems — in their hands the problems of improved flow pattern and reduced handling costs find their ideal solution.

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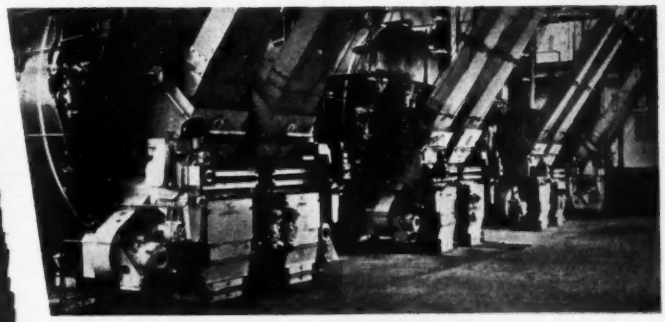
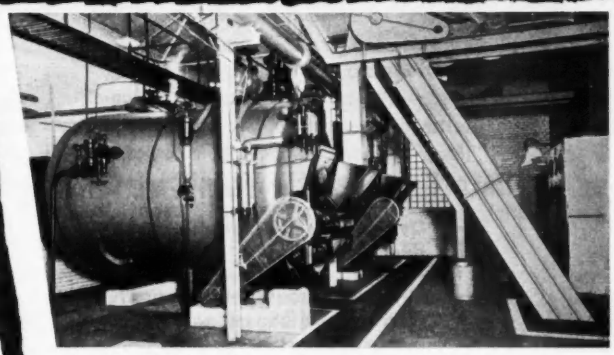


Bennis Chain Grate Stokers fitted to Economic boilers.



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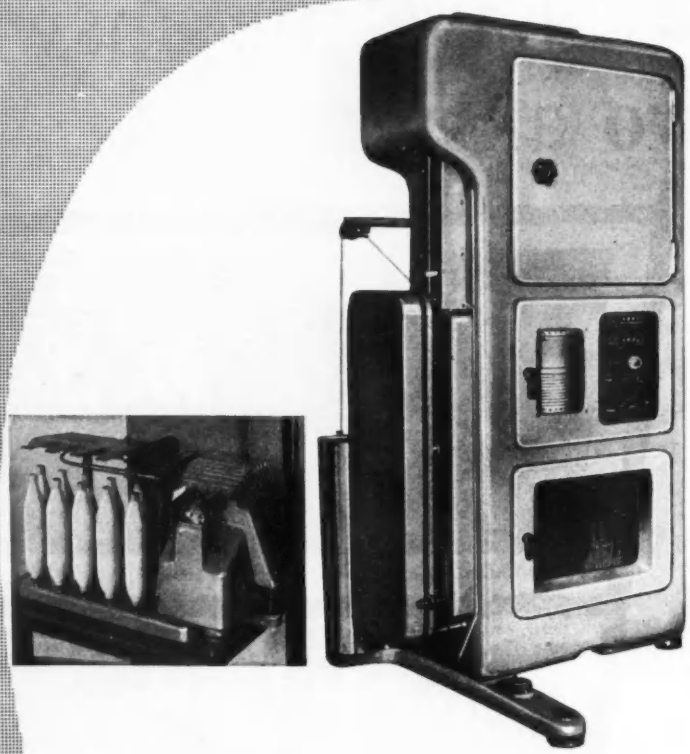

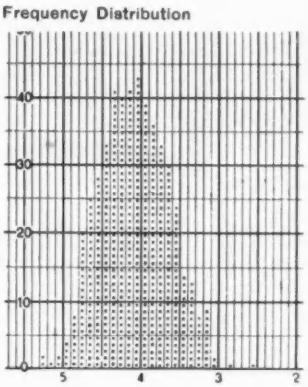

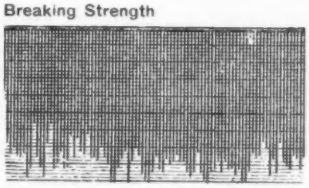

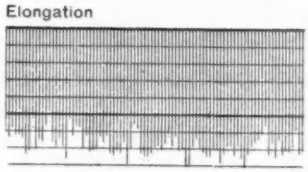

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Determines the breaking load and elongation of Single Threads

The continuous recording of the breaking load values shows periodical variations of the breaking load or elongation. The longer the period of testing, the easier it is to draw conclusions in ascertaining the cause of variation. The use of the Multiple Bobbin Attachment allows continuous testing of several bobbins.

Registers automatically the individual values and the sums of breaking load and elongation.

Each apparatus is equipped with 6 interchangeable weights for testing the breaking load of various strengths of yarn and 3 interchangeable weights for elongation.

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Eliminates the element of human error.

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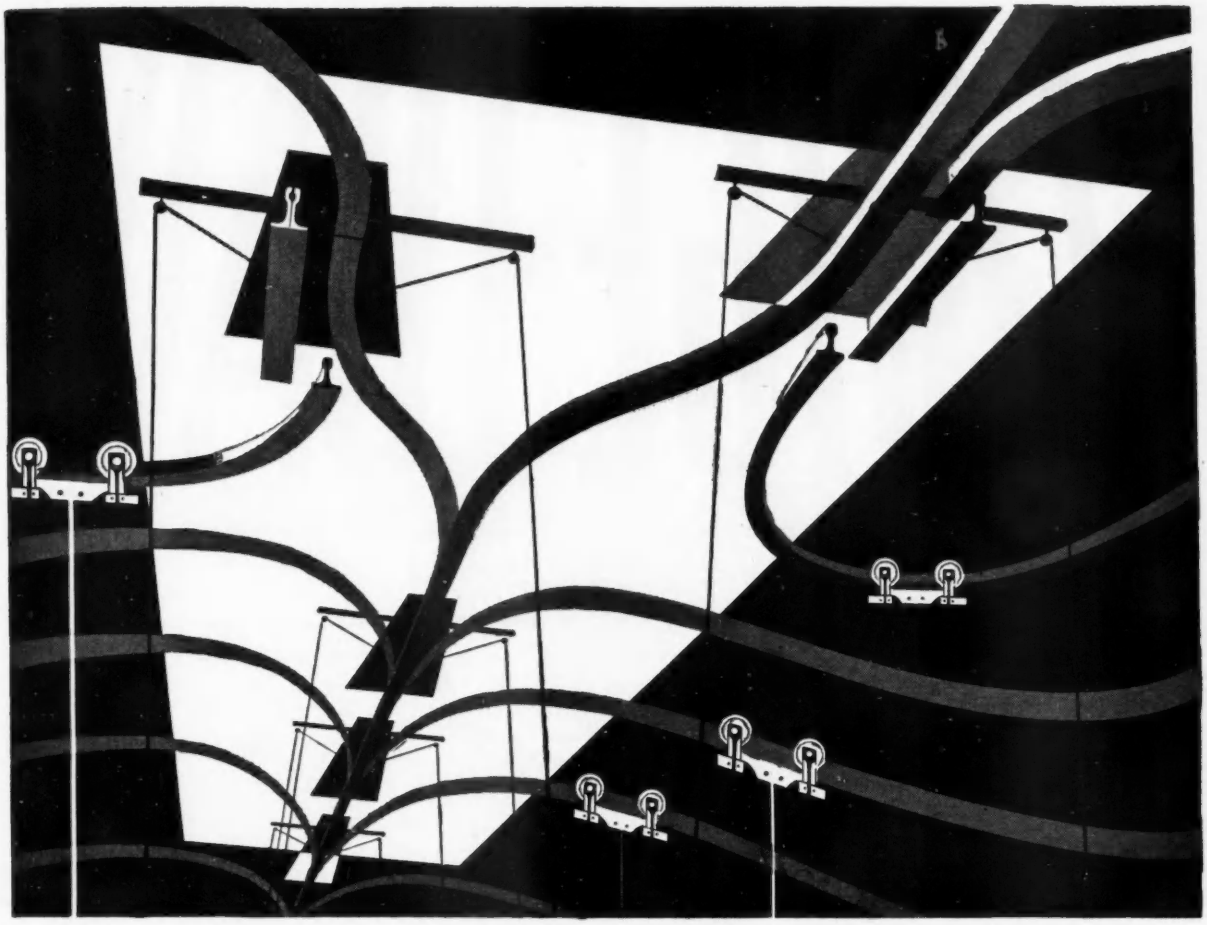

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. . . and the Belleville makes it possible . . . !

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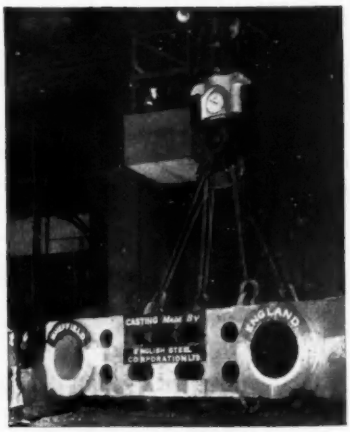
Two Belleville washers, in this instance opposed to each other, supply the spring resistant. Their total movement under full load of 200 tons is never more than $\frac{1}{15}$ of an inch.



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...always a spring ahead!

★ When resistance to load or thrust is beyond the capacity of helical springs,

★ When take-up of shock or sustained load must be restricted to very slight movement,

★ When many tons of dead load must be sustained plus intermittent shock or live load . .

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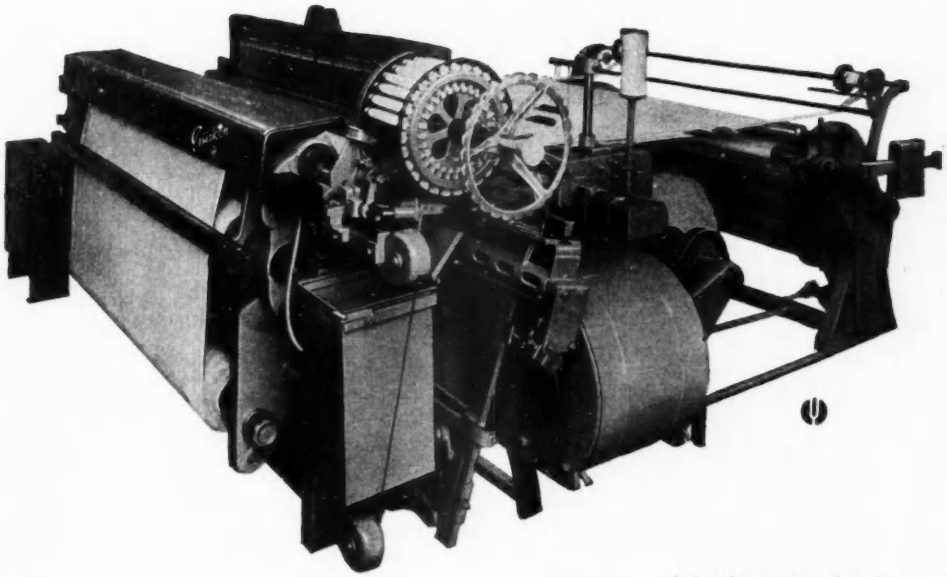

1-shuttle weaving, therefore very easy in handling,
also for not specialised personnel,
speed increased by 50% when comparing with other
types, fully automatic pirn changing battery.

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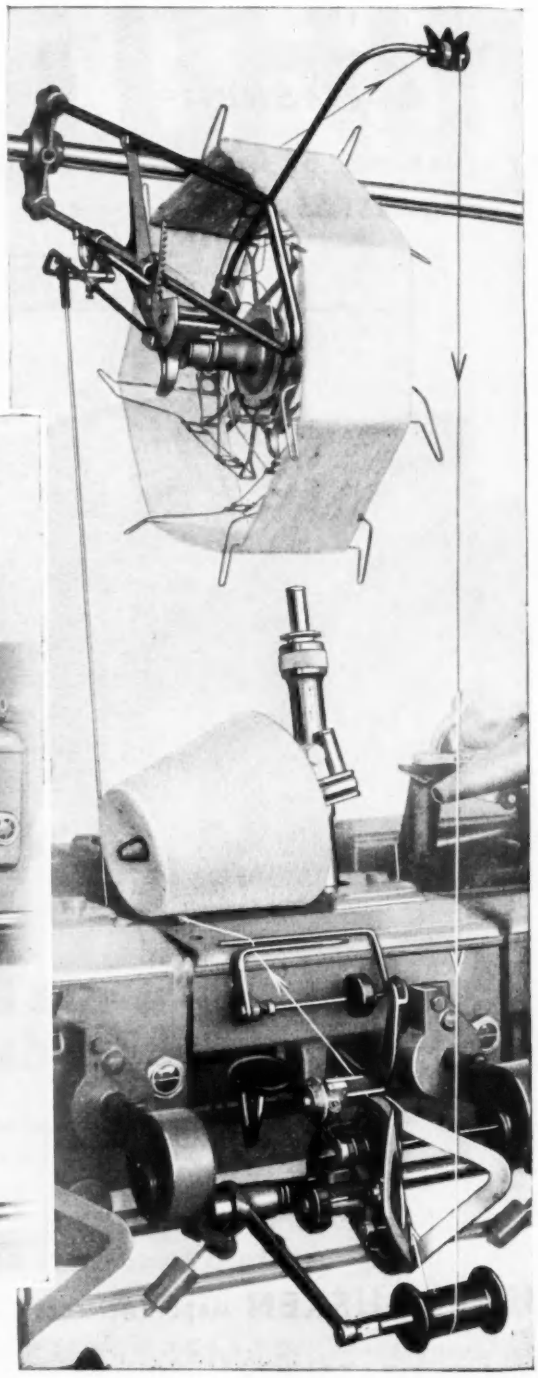
VARIO CONERS TYPES KM.5/7 & KM.7

THE VARIO CONER Type KM.5/7 has a yarn speed of approximately 440 yards a minute when winding from cop and approximately 200 yards from hank.

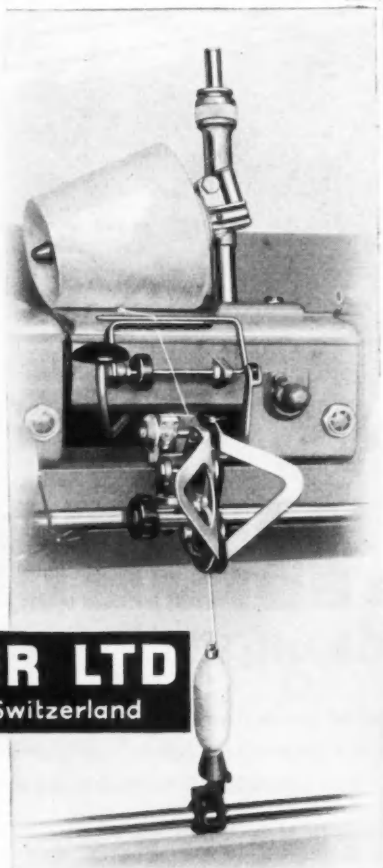
Supplies cross-wound packages of 9° 15′ initial taper, building up to approximately 16°. Each unit equipped with automatic stop when ends break on cone completion, and at entanglement of the yarn in the hank. Automatic securing of paper cone; swivelling expanding cone holder; increasing taper. Automatic lifting of cone for end piecing. Driving drum stops when cone comes to rest, thus cone cannot slip when restarted. Two-disc tension with or without positively driven dry waxing device. Staggered winding prevents patterning and bunching of cones.



THE VARIO CONER Type KM.7 is the ideal cross-wound package.

Designed and developed in accordance with strict mathematical principles, it completes its winding form by means of automatic mutually independent movements of the thread guide and the cone holder.

The cone is built upon a paper tube of 9° 15′ taper and assumes a progressive increase in taper as it builds up, the final taper being about 16°. The Vario Coner Type KM incorporates innovations designed expressly to increase production and improve quality.



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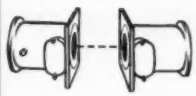

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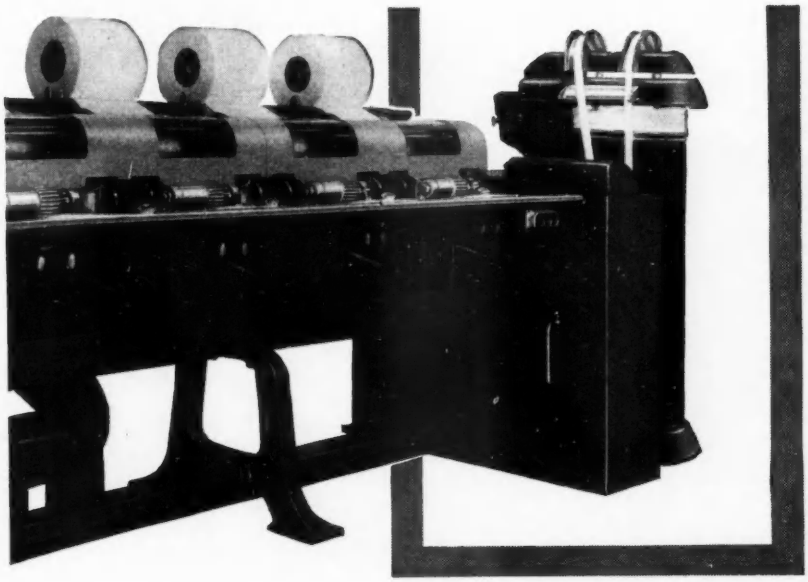

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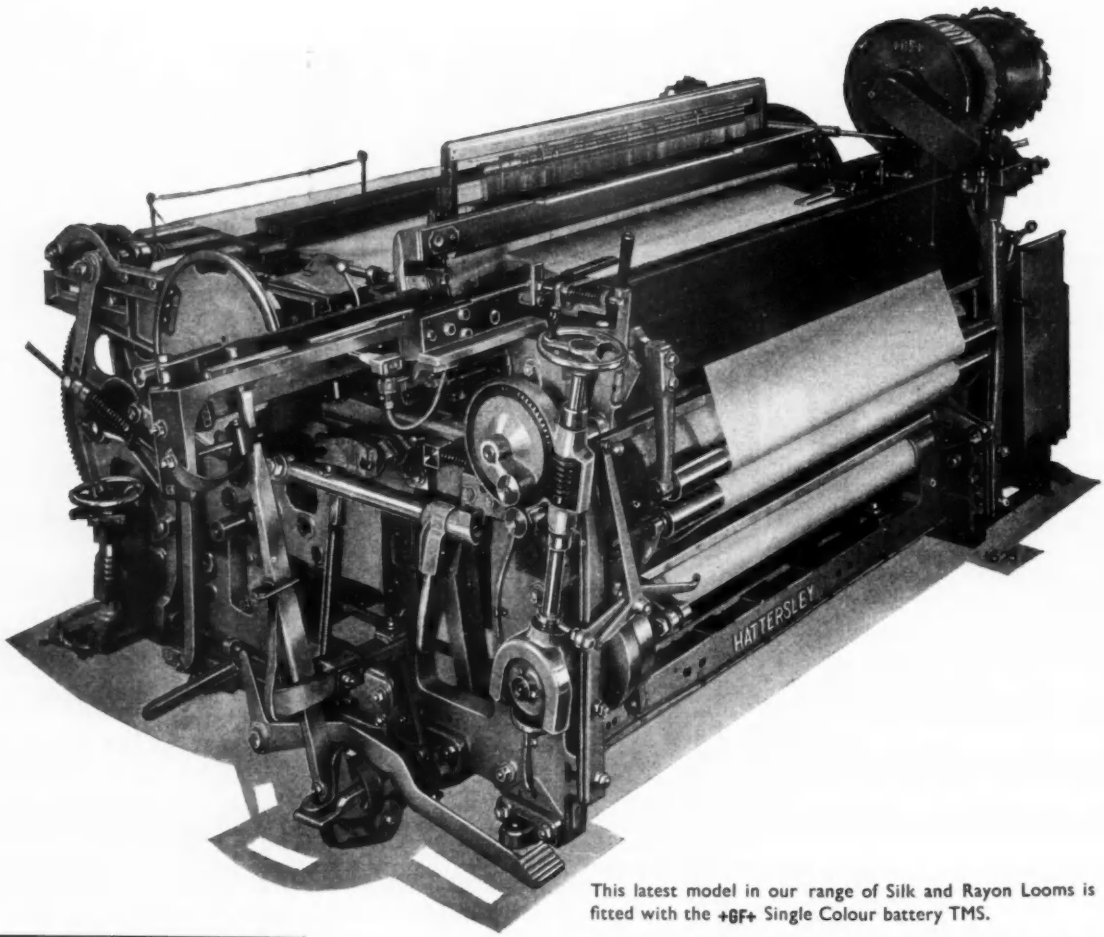

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Automatic PIRN CHANGING Silk & Rayon LOOM

This latest model in our range of Silk and Rayon Looms is fitted with the +GF+ Single Colour battery TMS.

The Loom illustrated is fitted with 4-shaft positive inside treading with rigid linkage, snap-on connectors, and no springs. Alternative treading arrangements include 10-shaft Cam box, or 25-shaft Dobby with either paper card or lags and pegs, or a Jacquard.

Let-off is by Bartlett system, with oscillating back rail. Alternatives include negative, or Epicyclic Vernier Automatic.

The Hattersley range of Automatic Looms for weaving Rayon and other filament yarns are available, in either Pirn change or Shuttle change form, for one, two, or four colours of weft. The non-automatic versions are either 2×2 box or 4×4 box pick at will.

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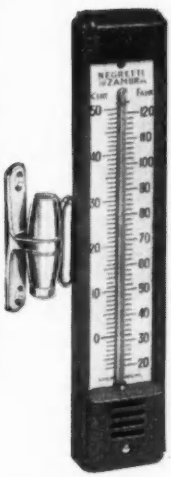
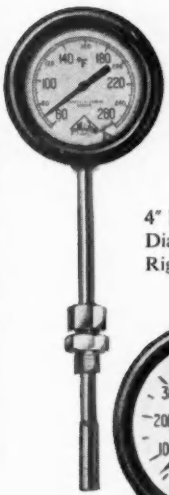
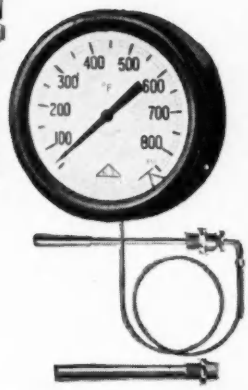


Room Thermometer
with plastic case

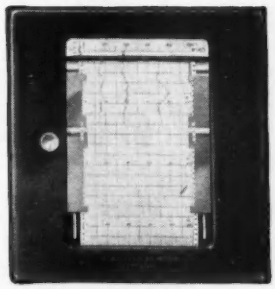
Brass-cased Tank and
Pipe Thermometer



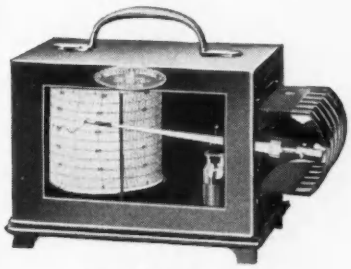
4" Mercury-in-steel
Dial Thermometer,
Rigid Stem Type



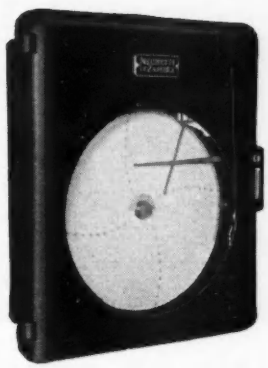
Distance-type Mercury-in-
steel Dial Thermometer



Resistance Thermometer
Recorder



Bi-metallic Recording
Thermometer



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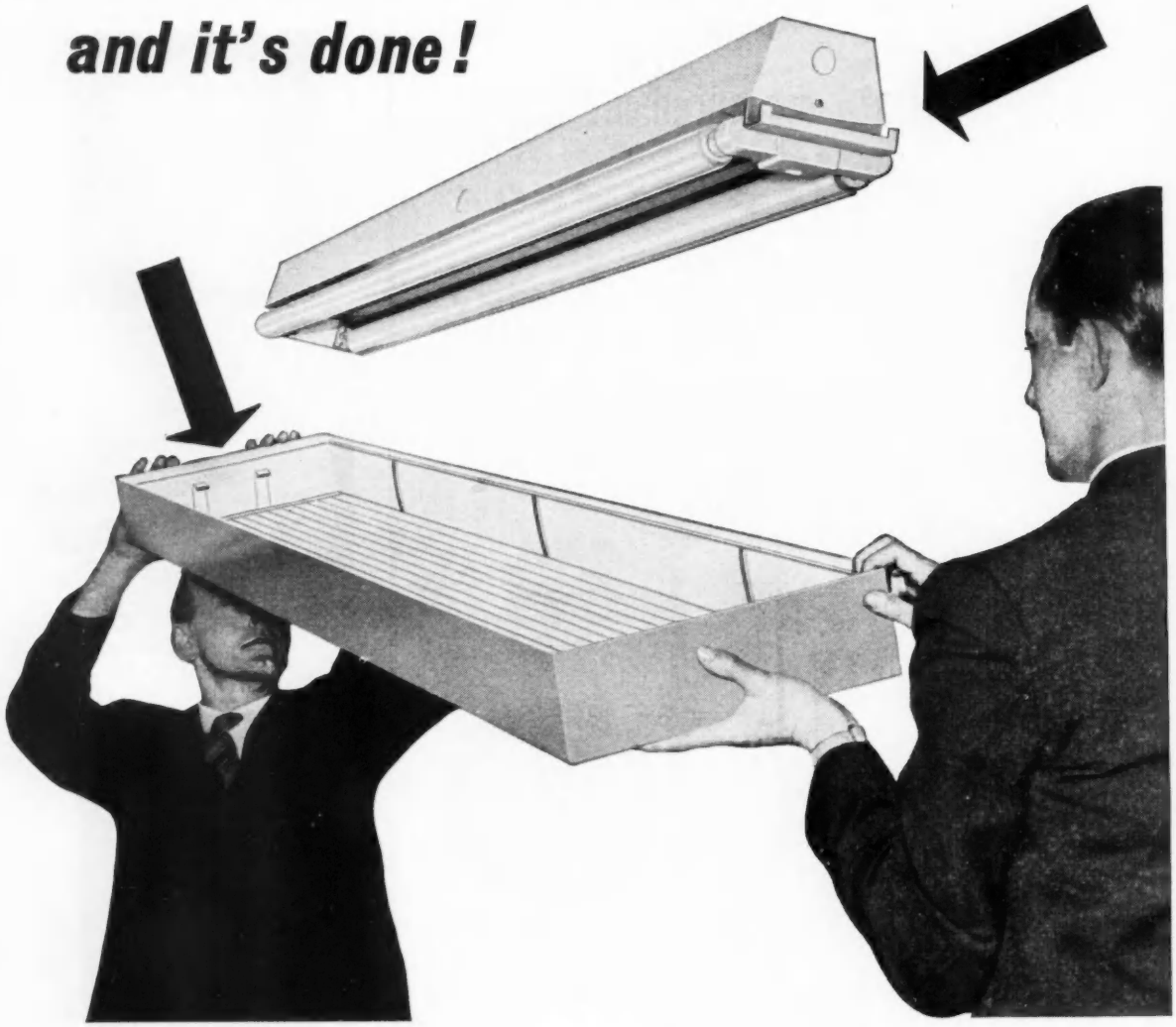
and it's done!



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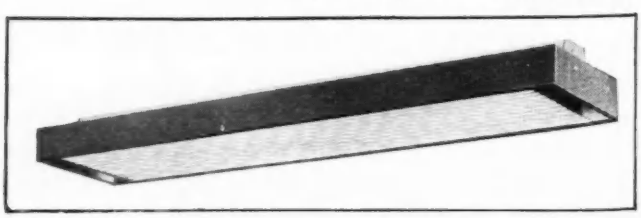

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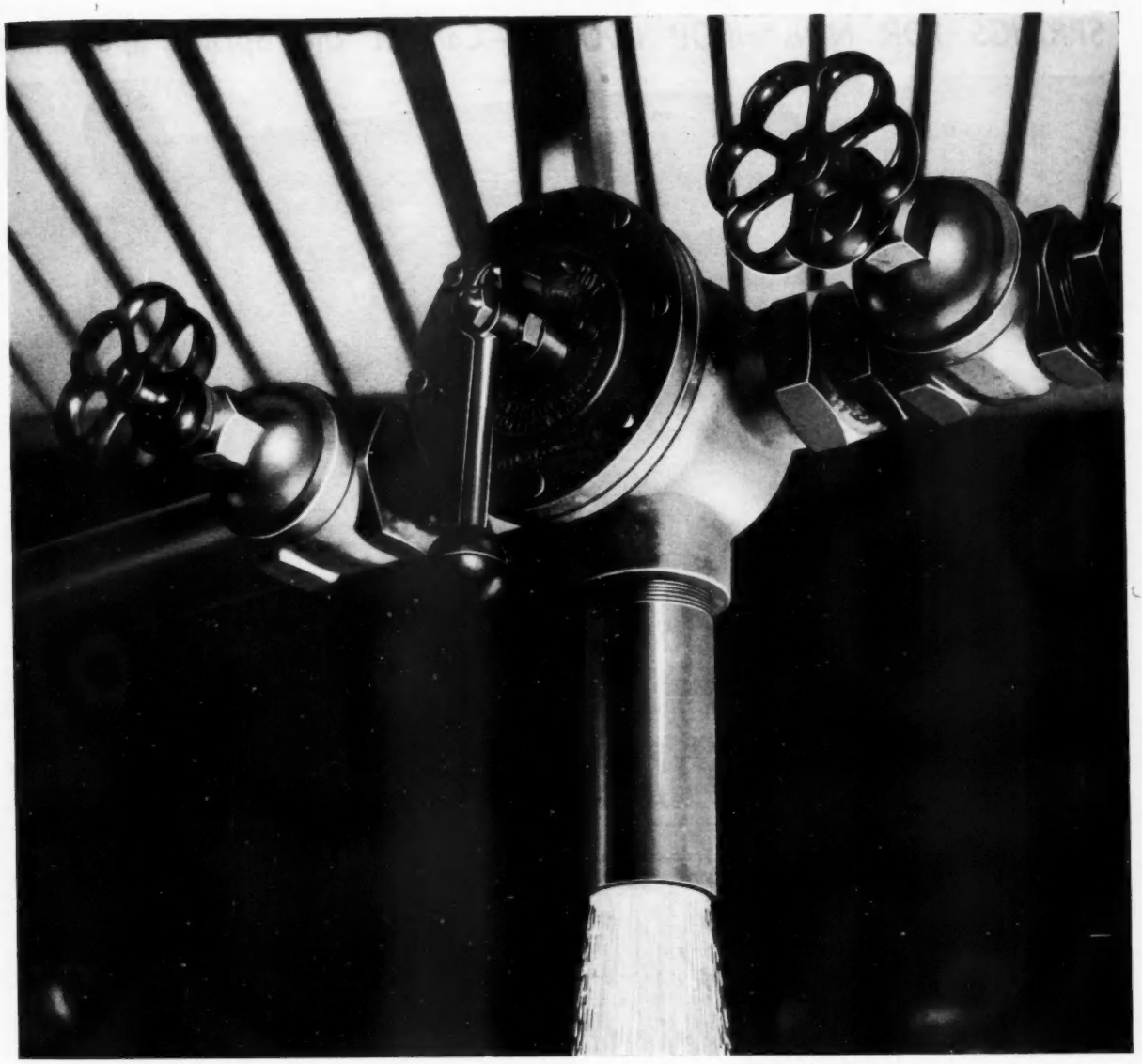

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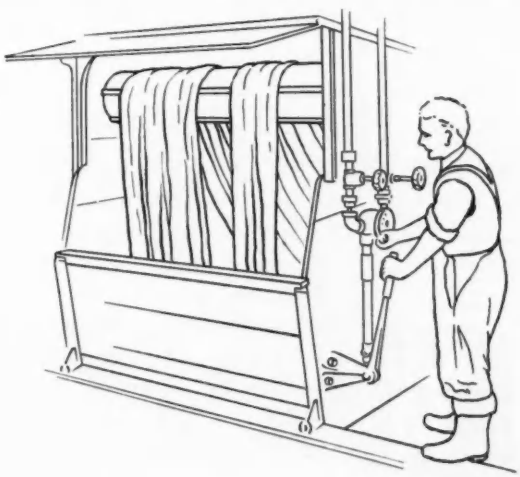

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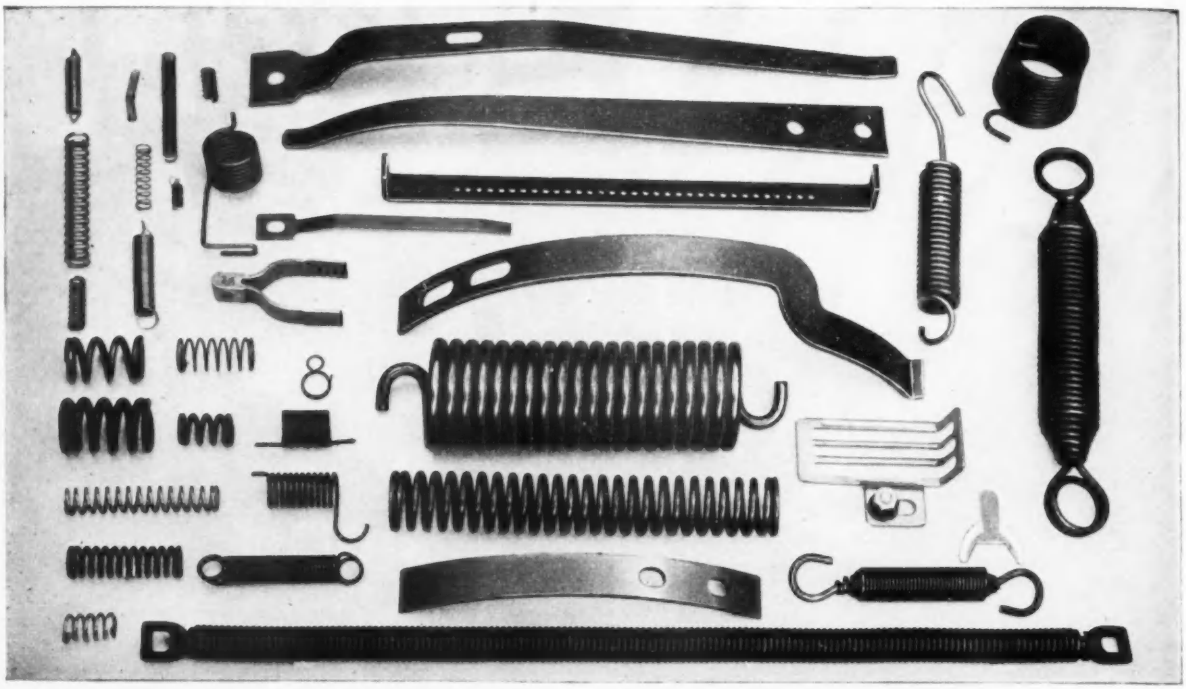

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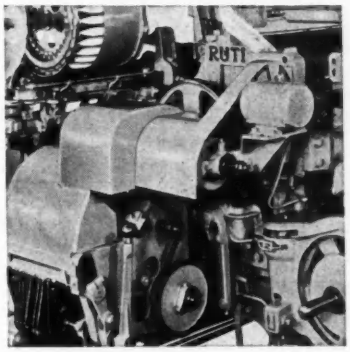

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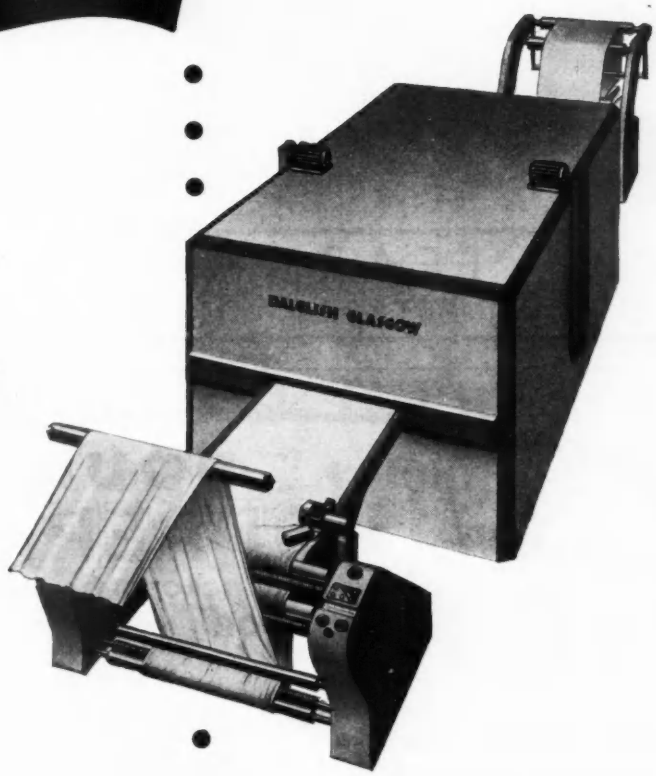

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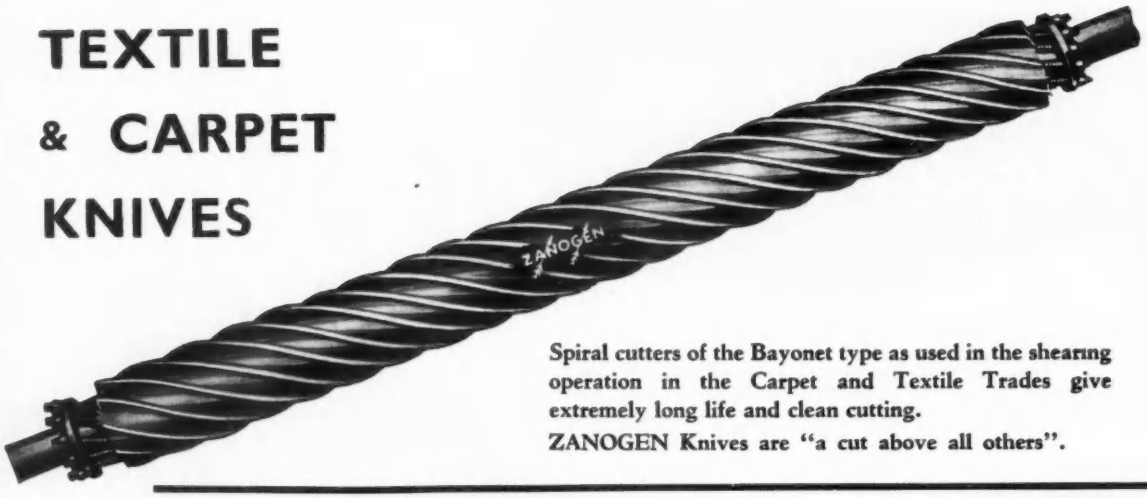

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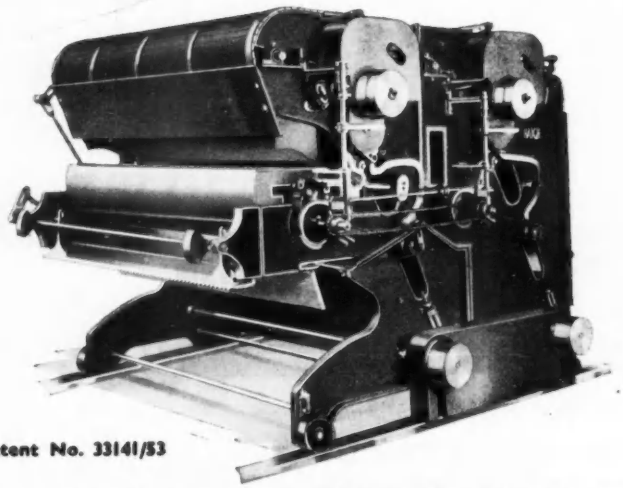

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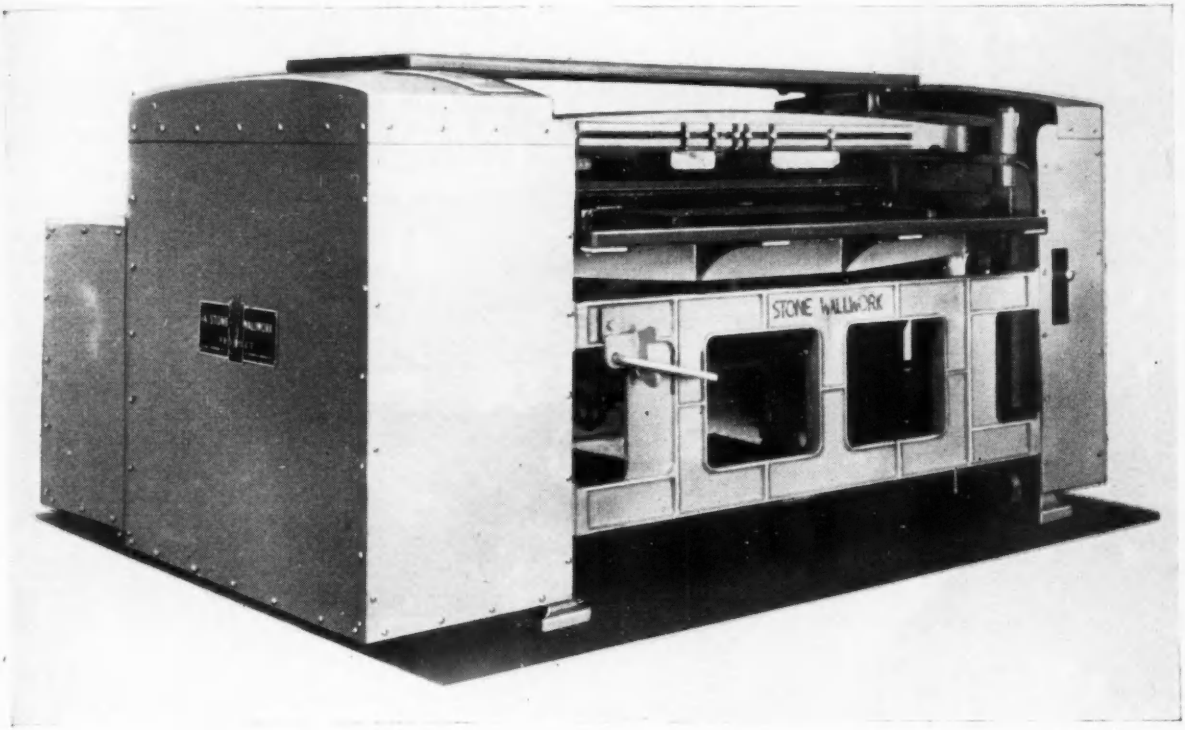

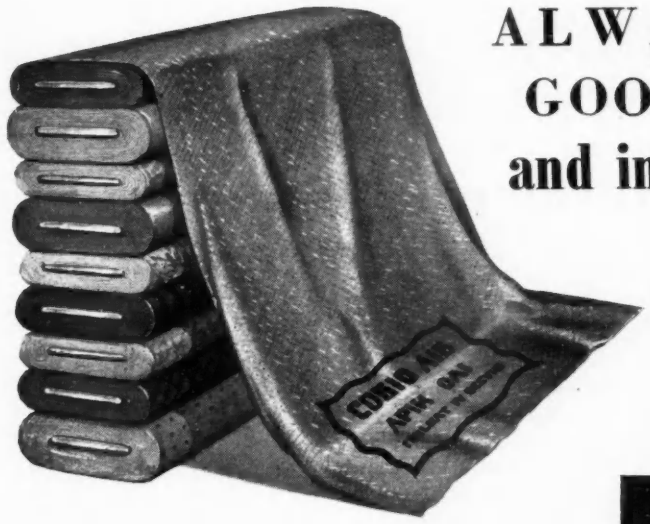

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MATERIALS - PROCESSES - PRODUCTION - MANAGEMENT

NO. 1002. VOL. 84 - JUNE 1958 - MONTHLY Two Shillings and Sixpence

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THE TEXTILE MANUFACTURER (*Incorporating* TEXTILE INDUSTRY AND EXPORTER, THE TEXTILE MACHINIST, THE HOSIERY, LACE AND SILK MANUFACTURER, *and* THE TEXTILE COLOURIST) is published on the first Monday of every month.

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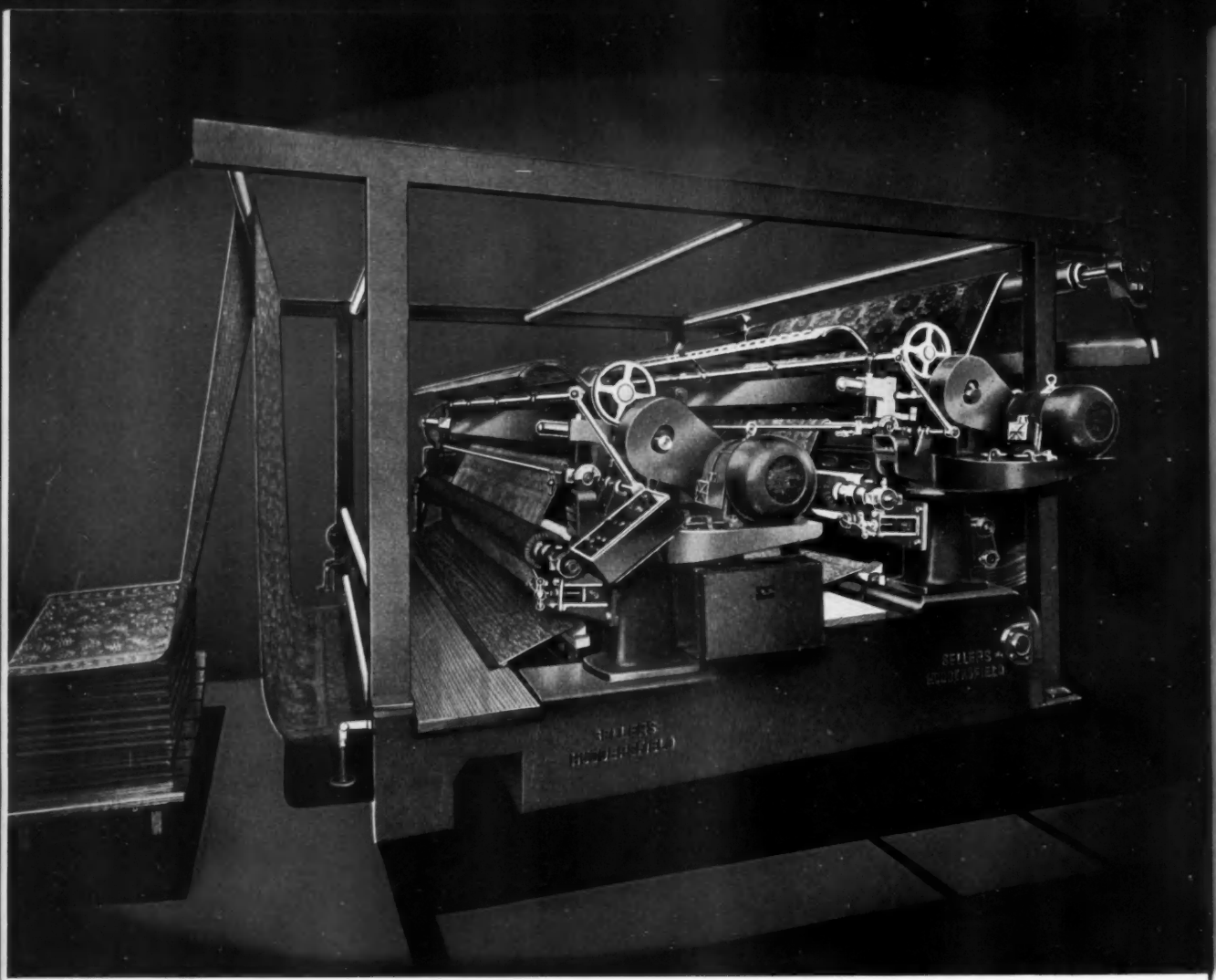

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Notes of the Month

PRODUCTION OF INDUSTRIAL FIBRES

WORLD production of the chief industrial fibres rose for the third successive season in 1956-57 to a new record level, according to *Industrial Fibres* (published recently by the Commonwealth Economic Committee, H.M. Stationery Office, price 5s.). The increase applied to all the main fibres except cotton. Aggregate fibre production in the free world during 1956-57 was very slightly higher than in the previous season, and the estimated total of 28,300 million lbs. was the largest ever recorded. Total fibre production in the Commonwealth continued to rise, appreciable increases in wool, cotton, sisal, man-made fibres and jute being recorded compared with the previous season, although flax output continued to fall. World consumption of the main apparel fibres again increased during the period under review, the overall rise amounting to some 4%. Stocks, by contrast, showed a downward trend. Those of cotton fell for the first time since 1950-51, as a result of the sustained level of consumer demand and the measures taken by the U.S. Government to dispose of its surplus holdings. Stocks of wool and jute also declined between 1956 and 1957. Price trends of the different industrial fibres exhibited quite marked divergencies during the 1956-57 season, but on balance world prices of cotton, silk, flax and sisal were lower than in the previous season, while those of wool, jute and manila hemp were noticeably higher. In the closing months of 1957, however, the movement towards a lower basis of prices became more widespread.

Production.—Total fibre production in the free world in 1956-57 was a shade higher than in the previous season. The overall output of natural fibres showed a slight decline but those of man-made fibres rose by 5%, which caused their share of aggregate output to increase from 17 to 18%. The Commonwealth produced a larger proportion of the world output of cotton, wool and the newer man-made fibres than in the previous season. Commonwealth production of rayon and hard hemp also registered an increase, but its proportion of the world total was somewhat lower, since output in the rest of the world expanded even more rapidly. The review summarises developments in cotton production during 1956-57, when the total crop in the non-Communist world was 3% lower than in the previous season, chiefly accounted for by a reduction in the U.S., where acreage restrictions brought about a 5% cut in output. Wool production, on a clean basis, was 6% greater than in 1955-56, while there was an increase of 5% in the output of man-made fibres (including a rise of 16% in that of nylon and the newer non-cellulosic types). Production of non-apparel fibres rose by about 2% over the previous season's total, primarily as a result of a 5% increase in sisal and other hemps, since the world jute crop was virtually unchanged compared with 1955-56.

Total Production of Industrial Fibres in the Free World
(thousand million lbs.)

	Pre-war average	1952-53	1953-54	1954-55	1955-56	1956-57
Cotton	11·6	13·9	14·5	14·2	14·7	14·3
Wool (clean basis)	1·8	2·2	2·2	2·2	2·3	2·4
Rayon and Acetate:						
Filament Yarn	1·0	1·7	1·9	1·9	2·1	2·0
Staple Fibre	0·4	1·4	1·7	2·0	2·2	2·5
Nylon and other man-made fibres	—	0·3	0·3	0·4	0·6	0·7
Silk	0·1	*	*	*	*	*
Flax	0·2	0·3	0·2	0·3	0·3	0·3
Hemp (incl. sisal)	1·9	1·9	2·0	2·0	2·0	2·1
Jute	3·3	4·7	2·8	3·1	4·0	4·0
Total	20·3	26·3	25·7	26·1	28·3	28·3
Man-made fibres as per cent. of total	6·7	12·6	15·3	16·4	17·2	18·0

* Less than 50 million lbs.

Prices.—During the second half of 1956 and the first half of 1957 prices of cotton, silk, flax and sisal were, on balance, lower than a year earlier, but those of wool, jute and manila hemp were all higher. Rayon yarn prices in the U.K. were raised by about 10% in January, 1957—the first general increase for several years. Cotton prices tended downwards until March, 1957, following the first disposals programme of U.S. surplus stocks for export at competitive prices, but throughout the remainder of the year they held firm on their new, lower basis. The upward trend in wool prices continued until May, 1957, but a decline then set in and in the first half of the 1957-58 season values were on a substantially lower basis. The downward trend in flax quotations, which continued throughout 1957, was chiefly the result of heavy sales of Russian flax at competitive prices. As a result of the Suez crisis prices of both jute and sisal had risen at the end of 1956, but from February, 1957 until the end of the year the trend was downward.

U.K. Price Indices for Selected Industrial Fibres
1947 = 100 (except flax: 1948 = 100)

Calendar Year	Cotton (American)	Wool	Silk	Flax	Sisal	Jute
1934-38 average	31	48	32	37	28	21
1952	192	228	151	140	211	126
1953	155	261	160	116	124	98
1954	161	250	146	116	113	107
1955	155	225	136	113	107	102
1956	132	228	128	103	103	104
1957	124	257	126	98	95	120
Dec., 1956	128	254	129	107	99	127
Dec., 1957	125	213	122	93	92	111

Trade.—The Commonwealth is an important supplier of industrial fibres to the rest of the world. Almost all the world's jute entering international trade is of Commonwealth origin, together with over three-quarters of the wool nearly two-fifths of the hemp, a sixth of the cotton and a tenth of the man-made fibres. Over all, the Commonwealth has a substantial export balance in fibres, since its net exports of wool, jute and hemp outweigh its net imports of cotton, flax, rayon and silk. The export balance in wool rose steadily from just over 1,000 million lbs. in 1953 to 1,275 million lbs. three years later, and net exports of hemp in 1956 at 100,000 tons were half as great again as in the

previous year and the highest since 1949. Net exports of jute were again very high at 528,000 tons, and only 2% short of the previous year's record. Net imports of cotton rose sharply in 1956 to nearly 600 million lbs. following increased Commonwealth purchases of American growths, while the import balance in man-made fibres also rose sharply to 114 million lbs. or over twice as much as in the previous year, due mainly to a doubling of Indian imports and a fall in U.K. exports. Commonwealth countries provide a substantial proportion of the United Kingdom's imports of the chief industrial fibres. Between 80 and 90% of this country's wool supplies are normally drawn from the Commonwealth and about one-fifth of its cotton, in each case a rather higher proportion than before the war. All the United Kingdom's jute and coir come from Commonwealth sources as well as about 80% of its hemp, compared with only 40% before the war. A special section in the review describes changes in the position of the six common market countries of Western Europe as markets for Commonwealth fibres. Nearly the whole of Western Europe's supplies of raw jute normally come from Commonwealth sources, together with over 80% of its wool imports and nearly 40% of its hemp. Western Europe's imports of Commonwealth wool have increased both absolutely and relatively in recent years and there has also been a marked rise in imports of Commonwealth hemp (sisal). By contrast, fairly small quantities of Commonwealth cotton are imported, and "the six" are themselves substantial producers of man-made fibres and also of jute manufactures, which are both protected by relatively high import duties.

New Fibres.—At the present time many of the most significant developments in the whole textile field are those affecting the newer, non-cellulosic man-made fibres. Production of the newer fibres continues to increase rapidly; in 1956 (the latest year for which full figures are available), there was a 16% rise in world output to about 650,000 lbs. although the rate of increase was somewhat less than in the previous year. The U.S. remained the largest single producer, followed by Japan, which has now replaced the U.K. as the second largest manufacturer. Nylon still accounts for the bulk of the total, but its proportion has declined with the development of the newer polyester and acrylic fibres such as "Terylene," "Orlon" and "Acrilan." The capacity of the industry is being further expanded in all major producing countries and by the end of 1958 it is expected to be at least 1,400 million lbs. or twice as great as in 1956.

* * *

QUALITY AUDIT—A NEW SERVICE TO THE INDUSTRY

SINCE early 1956 the Productivity Centre of the Cotton Board has been organising courses in quality control, and in considering ways of extending its services to cotton mills the Centre learned of the methods of quality improvement being used by the Raadgevend Bureau Berenschot (management consultants) in Holland. The most successful of these was known as the "X-ray" or "quality audit." As a result of an exchange of information this Dutch method was made available to Lancashire mills through the Productivity Centre, and after a detailed investigation of the method in Holland it was decided to carry out two experimental audits to evaluate the applicability of the method to Lancashire in spinning conditions. One of these audits has now been completed at one of the mills of J. and J. Hayes Ltd., Leigh, and the results have proved most useful and encouraging. The method is essentially the logical application of the scientific method to the problem of quality improvement. In the first instance, there is a systematic collection of data which relates to all the factors influencing quality. Secondly this data is interpreted and analysed with the aid of very simple statistical methods. The object of this is to trace back significant quality differences to the relevant technical and operating conditions of the processes concerned. Thirdly, on the basis of the results obtained a report is made to management and is framed in such a way that it provides a detailed foundation for future improvement.

In order to be able to analyse the interaction of all factors affecting quality, it is important to build this data around the investigation of one quality indicator. The quality audit method adopts "ends down" as this key indicator. It is not suggested that this is the only indicator but that it is probably the most suitable one and it will be seen that such factors as machine cleanliness, machine technical conditions, atmospheric conditions, operative methods, etc., can be profitably considered in relation to ends down. End breakage observations are therefore carried out on drawframes, speedframes and ringframe and last for two to three hours each. During this time the breaks occurring are recorded by their cause and notes are made about the various conditions influencing the quality production. Concurrently with these observations, checks are carried out on atmospheric conditions and a simple plus; plus-minus; minus scale used for the assessment of the state of cleanliness and technical condition of the machine being observed. The observers, who are previously trained in the identification of the causes of the breaks and in the technique of end breakage observation, also make a fairly detailed examination of the practices and methods adopted by the operatives. Each machine and each operative is observed several times, each time by a different observer.

These "ends down" studies and the associated surveys provide a large amount of information on varying matters all closely related and systematically collected. At the same time a good deal more information is required before a complete analysis of factors affecting quality can be made. "Ends down" studies start only at the drawframe and information on previous processes is clearly of great importance. A short survey of the blowing room is carried out to collect information on the cotton used, the method of blending, humidity control, settings and the like. Finally the quality of the product at every process is evaluated by measuring all the relevant characteristics. These include such measures as lap weight, nep counts, irregularity of slivers, count variation, etc. Each of the main characteristics affecting quality is then analysed separately and significant differences highlighted. In drawing conclusions from this data the emphasis is not so much on the comparison of a mill's present standards with some arbitrary standard or with the standards of another mill, but rather the comparisons with the standards it has set itself. The results on each factor are further examined in relation to end breakage and, since on ringframes for instance, approximately 60% of all end breakages are normally identified by cause, it becomes possible to relate the incidence of a particular type of breakage with some aspect of one of these factors.

Apart from constituting a once-for-all exhaustive examination of quality, the method is most useful for determining the effectiveness of cleaning, maintenance and training programmes. It also shows where routine controls are most needed and where the development staff should concentrate their attention. Probably the most important aspect of this method lies in the fact that all the data are collected by the mill staff and action is taken by the mill management. Local experiences is thus fully utilised in this large scale programme which helps a mill to help itself.

Dust Control Methods for Plant and Products II

Various air cleaning methods are discussed including gravitational; filtration, by dry and viscous filters and bag filters; sprays, as in air washers or wet arresters; centrifugal devices and the electrostatic precipitator, and vacuum systems

By F. H. SLADE, A.M.I.MECH.E.

GENERALLY, having arranged for the removal of dust at its point of origin, it is necessary to convey this dust to some central point and then to separate it from the conveying air. The first stage in the process of control, that is removal by means of an exhaust hood or other means, requires a movement of air at the point of origin sufficient to convey it to a collecting system. Once the dust particles are within the collecting or ducting system the air velocity must be sufficient to maintain it in suspension; as is indicated by the tabulated data shown in Fig. 10, and it must not settle out until the point of separation is reached. However, an important feature to be remembered in the design of any pneumatic conveying system is that since the horsepower required increases as the cube of the air speed, the ideal system is that with an air velocity sufficient to remove the refuse and not in any excess which demands a disproportionate increase in power consumption.

The duct system consists of branch pipes and risers connected to the various dust producing sources and the main duct which leads to the extraction fan and thence to the separator or filter. As already observed, if the air enters the risers with sufficient velocity the dust, or refuse, will be in suspension; the size of the main duct, at any point, must be in proportion to the size and number of rises entering into it.

Extraction can be accomplished with an air speed of 2,500 to 3,500 ft./min. and this velocity is usually maintained constant throughout the main run of ducting. In all cases, a constant velocity is highly desirable, since inaccurate grading may cause a velocity drop which allows the dust to be deposited in the ducting and block the system. For reasons of power saving a velocity decrease of 10 to 20% is nevertheless permissible in the risers when dust suspension occurs and the cross section of the main duct is correspondingly increased over the combined area of all risers. Increase in duct size with corresponding lowering velocity reduces friction in the duct and requires less power at the fan.

The ducts leading from the collection points to the exhaust fan are usually constructed of sheet metal; free from dents, fins and projections on which dust might collect. All permanent circular joints require to be lap-jointed, riveted and soldered, and all longitudinal joints either grooved and locked or riveted and soldered. Circular laps should be in the direction of flow and ducting installed out-of-doors should not have the longitudinal laps at the bottom. Every change in pipe size is made with an eccentric taper at the bottom, this taper being at least five inches long for each inch change in diameter. It is also recommended that the main duct and branches are as short and straight as possible, strongly supported and with the dead ends capped to permit inspection and cleaning. The branch pipes should join the main at an acute angle, the junctions being at the side or top and never at the bottom of the main. Furthermore, they should not join the main duct at points where the material from one branch would tend to enter the branch on the opposite side of the main.

To provide easy access to every part of the system in the event of clogging occurring, it is usual to locate clean-out openings, with suitable covers, in the main and branch ducts. Additionally, a large clean-out door should be placed in the main suction pipe near the fan inlet. Alternatively, a detachable section of ducting, held in position by lug bands, may be provided. Elbows should be made at least two gauges heavier than straight ducting of the same diameter, to enable them to withstand the additional wear caused by changing the direction of the flow. They should preferably have a throat radius of at least one and one-half times the diameter of the duct. It is most important that each duct is kept open and unobstructed throughout its entire length. Thus no fixed screen should be placed in it, although the use of a trap at the junction of the hood and branch pipe is permissible, providing it is not allowed to fill up completely. Good design also advises that at the point of entrance of a branch pipe at the main duct there should be an increase in the latter equal to the sum of the two ducts.

Separation Methods

Separation or air-cleaning methods in common use are classified according to the principle of air-cleaning employed. These are (*a*) gravitational, as in settling chambers, (*b*) filtration, by dry and viscous filters of both unit and automatic types, also bag filters, (*c*) sprays, as in air-washers or wet arresters, (*d*) inertial, exemplified by centrifugal devices, and (*e*) the electrostatic precipitator. To the grouping could be added vacuum systems which, however, usually terminate in a centrifugal collector or textile filter, and the method of lowering the temperature or pressure sufficiently to cause condensation of moisture to form upon the dust. The latter is done only to increase the weight of the particle, the actual separation being effected by centrifugal action on the greater mass.

Rating of the various types of

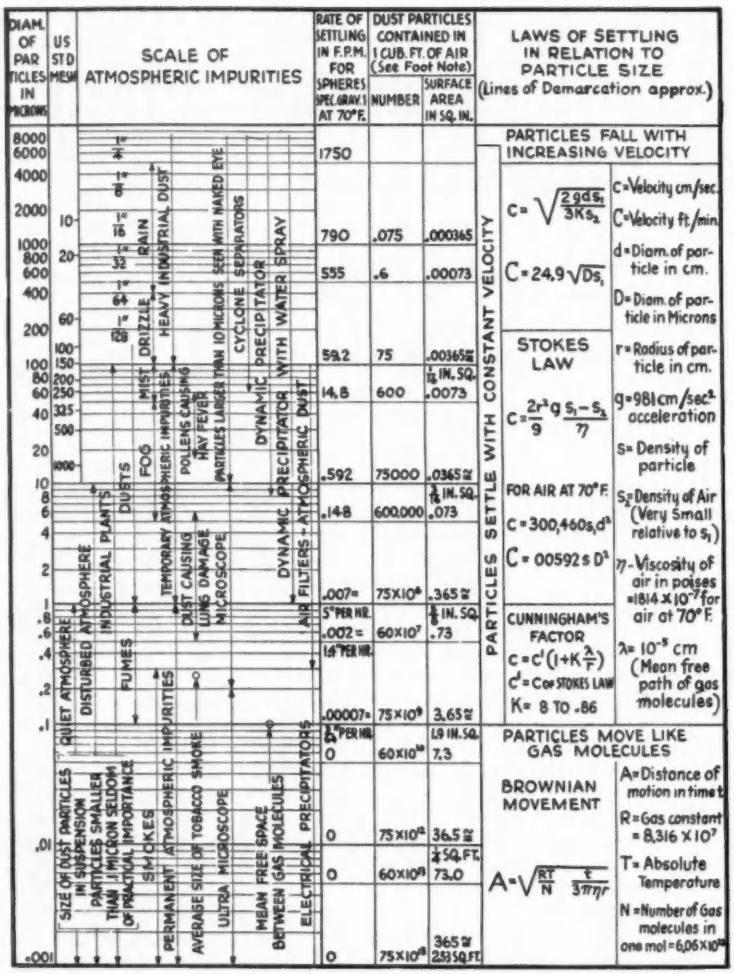

Fig. 10. The various laws of settling, together with their limitations are tabulated above

equipments used for separation is, in the main, governed by (*a*) capacity in cu. ft. of air handled per minute; (*b*) resistance in ins.w.g. at rated capacity; (*c*) dust arrestance, the percentage relationship expressing dust removal efficiency at rated capacity; (*d*) reconditioning power, the energy necessary to operate the mechanism of an automatic air-cleaning device and (*e*) dust-holding capacity; the amount by weight of standard dust which a non-automatic air-cleaning device will retain before reconditioning is necessary.

Settling Chambers

For removing dust particles gravitationally settling chambers are effective provided time and space are allowed for the particles to settle out. Since the settling rate is constant, the required time of retention of the air in a chamber varies directly with the distance through which the particles must fall before reaching a retaining surface. It is desirable that the chamber is made wide and low, rather than high and narrow. Horizontal plates placed parallel with the air flow are effective and introduce negligible resistance, whilst air flows should be selected so that the settled dust will not redisperse. For this reason, baffles or constrictions producing increased velocity or turbulence are to be avoided. In proper design, the inlet and outlets are placed and baffled so as to cause minimum turbulence, and the collected dust is protected from eddy currents.

The relationship between time of air passage, distance of fall and size of particle removed can be calculated from Fig. 10; compiled by W. G. Frank and indicating the laws of settling in relation to particle size, free-settling velocities, methods of separation, etc. A given example is that with a forward velocity of 50 ft./sec. passing between horizontal 14 ft. shelves placed 3·3 in. apart vertically, particles of 100 microns which settle out at the rate of 59·2 ft./min., will have time to settle through the 3·3 in. vertical distance and reach the shelf while the air is passing along the shelf. It must, however, be observed that, due to redispersion, actual operation will be much less favourable and it is usual practice to allow a settling rate of 50% of the theoretical, especially in respect to particles less than 200 mesh (74 microns in diameter).

Textile Filters

One filter in common use industrially is the canvas-bag type, such as illustrated in Fig. 11. This reproduced photograph shows equipment produced by Air Control Installations Ltd. In practice and principle bag filters are similar to those now used for general ventilation, the latter being a development of the former. The ideal bag has a low resistance to air flow, does not swell with damp conditions of the air, has high mechanical strength, is light in weight and above all does not easily ignite; so far no material has been found which complies with all these requirements, but woollen fabric is a good substitute for the time being. In addition to wool, a number of other materials have been tried or are even in use, such as cotton, canvas, glass fabric, woven asbestos, and some of the modern synthetic materials, but in most cases they leave much to be desired from the efficiency point of view, or are almost prohibitive in cost.

Assuming that a suitable woollen cloth, with a hairy surface and a not too close weave has been obtained, it is made up into tubular-shaped bags or stockings which fit over suitable spigots at top and bottom ends; the bags may be from 6 to 30 ins. in diameter and from 6 to 30 ft. in length and are hung so that their upper ends are closed and their open lower ends are fastened to the air inlet header which also serves as the hopper for catching dust which is shaken down from the bags. In some designs both upper and lower air inlet headers are used and in these cases the bags are open at both top and bottom. In either design, the collected material is dislodged from the bags periodically by a mechanical shaking device.

With proper filtering mediums, dust

retention capacity is high, except sometimes immediately after the filtering medium has been cleaned. The surface area of the filter should be sufficient to pass the total volume from the exhauster at a speed not exceeding 7½ ft./min., which would set up a static head of about 1½ to 2½ ins. w.g., depending upon the texture of the filtering medium. Tests, however, indicate a basic cloth resistance which, in the main does not diverge from the region of 0·2 to 0·25 ins. w.g. The minimum value recorded was 0·17 ins. w.g., and the maximum 0·32 ins. w.g. The basic dust resistance varied from 0·14 to 0·25 ins. w.g., with a preponderance of values at 0·20 ins. w.g.

Where compactness of design is essential, it is preferable to use small diameter bags since they render it possible to provide a greater total filter area in a given space than large bags. Efficiency is largely dependent upon keeping the bags clean, thus demanding frequent attention that might well prove a nuisance. For this reason the bag filter is sometimes used in series with a cyclone. The latter requires comparatively little attention and can be used to collect the coarse dusts; the fabric filter removing the fine dusts.

Pressure loss, due to the high velocities involved in dust conveying, may be minimised by paying attention to dust connections to filters. Thus, if an inlet duct can be arranged to slope down to the filter, an expander can be used to reduce air velocity. The slope will ensure that dust will not settle within the transformation piece. If the taper has a slow rate of expansion and halves the air speed, the shock loss will be reduced to about one-quarter of the value for the original air speed. When the filter is on the discharge side of the fan, the air leaves the filter in a clean state and at low velocity.

Wet Collectors

Even the finest sprays are of low dust collecting efficiency when used in an open chamber. Impact of the dust particles against a wetted surface is necessary for their retention. An example are the washers incorporated in air conditioning systems, as humidifiers or dehumidifiers. Contact between air and washer-water in this type of equipment is secured by a combination of water-sprays and wetted plates; the latter being generally composed of one to three eliminator-type baffle plates placed in the air-stream to cause several reversals of the direction of air flow.

Fig. 12 shows a Sturtevant wet arrester, a device designed to remove the dust from the air stream by bringing it into intimate contact with a liquid so that the dust becomes suspended or dissolved in the liquid. If power is used to atomise the liquid or otherwise improve the efficiency of the equipment, it is usually called a scrubber. As the dust leaves the washer, dissolved or suspended in a liquid, it is necessary to provide a filter or settling chamber for this sludge in order to recover the liquid for recirculation.

If the dust has value and is to be recovered, filtering, settling or drying is necessary. In many cases the recovery of the dust in dry form is much more desirable than recovery as a sludge and under these circumstances a washer or scrubber is unsuitable. A simple "rain tower" in which water droplets merely fall through the air is not very effective in cleaning the air. If baffles are provided so that the air must follow a tortuous path then some of the dust is thrown out of the air by centrifugal force and some by simple impingement or by striking the wet surfaces, thus considerably improving the collection efficiency. This can also be accomplished by loosely packing "Raschig" rings in successive beds in the tower. The rings are made of ceramic material about ¼ in. thickness by up to 2 ins. in length and 2 ins. dia., the beds may be up to 12 ins. in depth. These "beds" present a multitude of wet surfaces and the ceramic material possesses a distinct advantage in that it withstands corrosion. The final item in a washer of this type consists of eliminator plates which

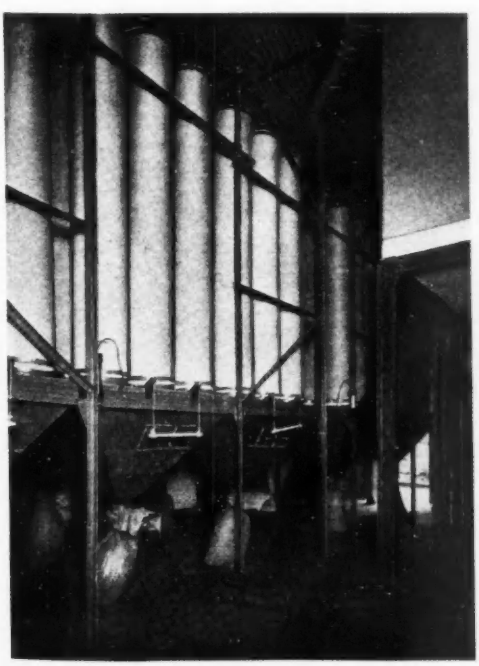

Fig. 11 (left). One filter in common use is the canvas-bag type. With proper filtering mediums, dust retention capacity is high, but the resistance of the filter should not be permitted to exceed the design maximum

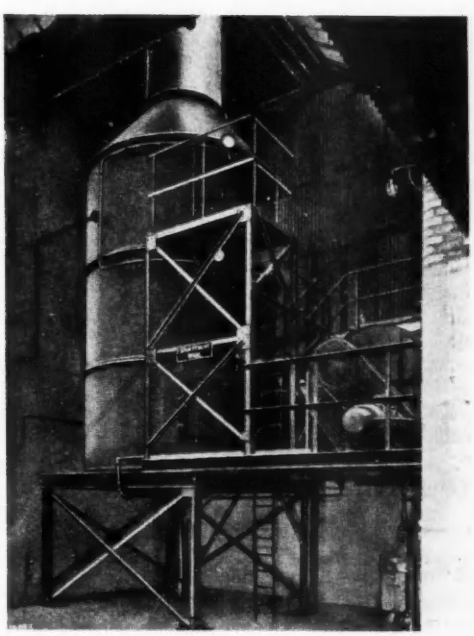

Fig. 12 (right). Typical arrangement of a wet dust arrester and fan. Efficient design demands impact of the airborne solids against a wetted surface for their retention

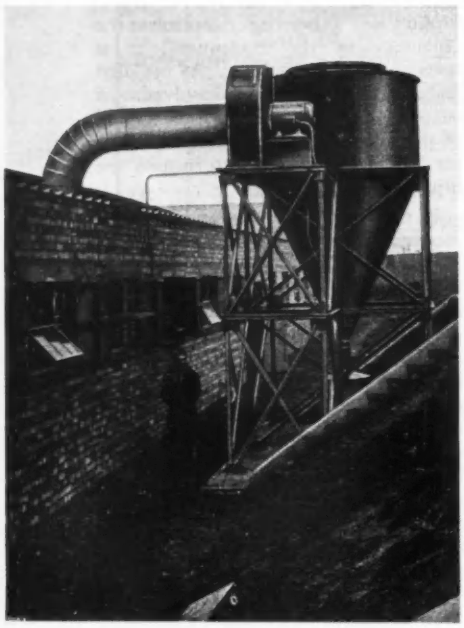

Fig. 13. The principal type of centrifugal collector is the cyclone. This type invariably obtains dust separation by projecting the dust particles tangentially out of the air

remove the excess of free moisture from the cleaned air.

Centrifugal and Inertial Apparatus

The centrifugal or cyclone collector is the most common example of this type of unit, being used extensively in industrial exhaust systems to separate the dust and other materials from the air stream. The mixture of dust and air is introduced on a tangent near the cylindrical top of the collector. The whirling motion sets up a centrifugal action, causing the comparatively heavy particles suspended in the air to be thrown against the side of the separator. From this position they spiral down to the tailpiece, while the air escapes through the stack at the centre of the collector.

Separation of dusts from the air is caused by centrifugal force, and this, being directly proportional to the air velocity and inversely proportional to the radius of curvature of the air stream, can be made very large by assuming high air velocities, with a small radius of curvature. For example, in terms of gravity, the separating force for an air velocity of 60 ft./sec. and a 10 ft. radius of curvature of air path, is 11 times gravity. For a 1·0 ft. radius, it is 112 times gravity, and for a 1·5 in. radius, it increases to 896 times gravity.

The principal dimensions affecting the shape of a cyclonic apparatus are (*a*) the inlet angle of the dust-air mixture, (*b*) diameter of cyclone, (*c*) air exhaust diameter, (*d*) length of exhaust pipe in cyclone, (*e*) height of cyclone, (*f*) height of cylindrical section of cyclone, (*g*) width of air inlet and (*h*) height of air inlet. A gradual entry of the dust-air mixture into the cyclone is essential to high efficiency and it is found that this is a maximum when the inlet angle is equal to 180°. Efficiency decreases rapidly when the length of the exhaust pipe becomes too low. Increasing the height of the cyclone and enlarging its diameter has the effect of increasing efficiency, but in each case at the expense of higher initial cost and space requirements. The latter also increases pressure loss. In order to decrease pressure loss it is desirable to make the cross-sectional area of the inlet not much smaller than that of the exhaust.

There are no proportions that may be regarded as standardised for cyclones, but the following have been quoted to give good results for those handling normal dusts. The inlet area should be at least equal to the main suction duct. The area of the air outlet should be four times the inlet area. A rectangular air inlet should have a height equal to the diameter of the air outlet and a width equal to one-fifth the diameter of the outlet. The outside diameter of the cyclone should be twice the diameter of the air outlet. The height of the cylinder at the top of the separator should be one-and-a-quarter times the air outlet diameter. The vertical length of the cone should be one-and-threequarter times the air outlet diameter. The dust outlet should be 0·22 times the air outlet diameter. These dimensions are subject to large variations.

The actual size of a cyclone depends upon the volume of air and the size of dust particles to be collected. Coarse materials can be collected with comparative ease and at a high efficiency in cyclones up to 14 ft. dia., but the presence of a quantity of particles below about 20 microns would reduce the collecting efficiency very considerably, in fact, "ordinary dust" from 1 to 20 microns in diameter cannot be removed by the usual cyclone collector. Two reasons for this are that the centrifugal action is very feeble due to the small mass of relatively large radius of movement, and the time element for the passage of dust to the outer surface is large; turbulence also tends to prevent the steady cross-current of dust through the revolving air. This can, however, be overcome to a certain extent by the use of a large number of units each of smaller radius; a condition which naturally increases cost.

A standard cyclone produced by Sturtevant Engineering Co. is illustrated in Fig. 13, whilst in Fig. 14 are shown high-efficiency units manufactured by the same concern. The latter are a development of the standard cyclone, the improvement being emphasised in two main features, i.e. the design of the inlet, and the length of body and cone. The inlet takes the form of a true volute, as opposed to the tangential entry in the ordinary

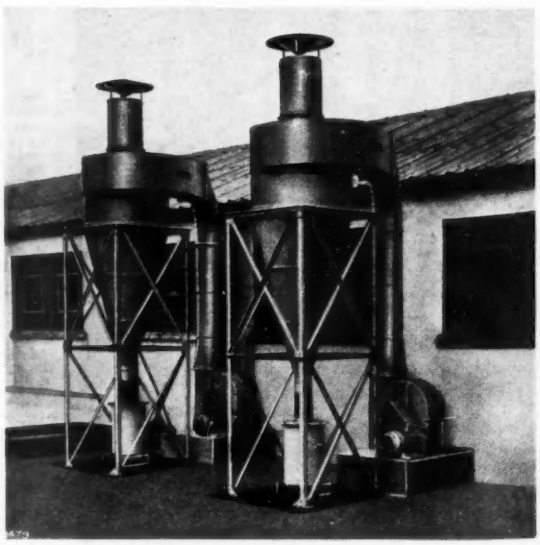

Fig 14. The high-efficiency cyclone is a development of the standard apparatus, the improvement being emphasized in the design of the inlet and the length of body and cone

cyclone. This has the obvious advantage of reducing to a minimum the disturbance caused by incoming air to the already rotating air and dust in the body of the cyclone. It is a further advantage, having set up rotational movement in the cyclone, to prolong this condition within reason and this is done by deepening the body and elongating the cone.

The "Davidson" centrifugal dust collectors shown in Fig. 15 are a component part of "Sirocco" dust removal and collection plant. These, a result of exhaustive experiment and test, will deal with practically every kind of textile dust. The design is, it is claimed, capable of collecting from 90 to 98% of the dust contained in the air, while the resistance to the flow of air is constant and reasonably low with consequent economy of power absorbed by the fan. Sound construction is essential to separation efficiency of a cyclone. The interior should be accurately made and fitted, and well polished; all surface roughness and eddy-forming projections must be eliminated.

Electrical Precipitators

As these devices have received considerable attention in previous articles, it is intended now to deal but briefly with the subject. They find a ready application for removing fine dust which shows no gravitational settling tendency. The whole theory of electrical precipitation lies in the ability to charge the dust by chance encounters with the ions in an electro-static field. The only effect of the electro-static field is to attract the foreign particles. Factors bearing on efficiency are voltage, current, air velocity and size of discharge electrode. The air velocity is very important, for the slower the velocity, the greater is the chance of an encounter between an ion and a dust particle.

There are two main methods of operation, the "two-stage" and the "single-stage". In the former, the first stage only is equipped with corona-forming electrodes to produce the air ions necessary for charging the dust; the second stage has non-discharging precipitating electrodes opposing the collecting electrodes, between which is maintained a corona-free field for precipitating the particle ions from the first field. In the latter method, corona discharge is maintained throughout, which, because of the space charge of the air ions, makes for high-intensity precipitating fields. It also recharges neutralized or discharged particles and exerts a pressure on the precipitated materials to hold it on the collecting electrodes and prevent redispersion. As will be understood, the two-stage method is best suited to air cleaning where the dust concentration is low and minimum chemical activity is desired. The single stage is most applicable to process and industrial applications, i.e. for ordinary concentrations of dispersoids where it is required to prevent redispersion at reasonable air velocities.

Broken-End Collection

Replacing revolving under-cleaners on ring spinning frames and adaptable to any make of machine within this group, the unitary "Pneumafil" system of pneumatic broken end collection (Figs. 16 and 17) is claimed to (*a*) reduce spinning labour requirements, (*b*) increase production from frames so fitted, (*c*) improve quality of yarn, (*d*) reduce operative effort and (*e*) improve atmospheric conditions in the ring room. The latter feature is, of course, of main interest to this article and it is achieved through the system continually sucking away short fly and fluff, and an improved circulation of air; especially in the working zone. Furthermore, if the spinning room is air conditioned, "Pneumafil" improves distribution. The suction at the apertures ensures that the conditioned air is drawn down on to the yarn where the "draw" and "twist" is taking place.

Other factors conducive to improved yarn quality are that (*a*) loose fibres are continuously sucked away from the yarn as it passes over the suction apertures located at the leaving side of the front rollers and (*b*) slubs caused by fibres touching the yarn when under-cleaners are loaded with broken ends or when the under-cleaners are taken out for clearing, do not occur. The system offers, as illustrated in Fig. 18, equal advantages applied to wool and worsted, being designed for fitment to either new or existing ring and cap frames or mules. Installations have been made on

Fig. 15. "Davidson" centrifugal dust collectors installed at a large textile factory; for the collection of dust from scutching machinery

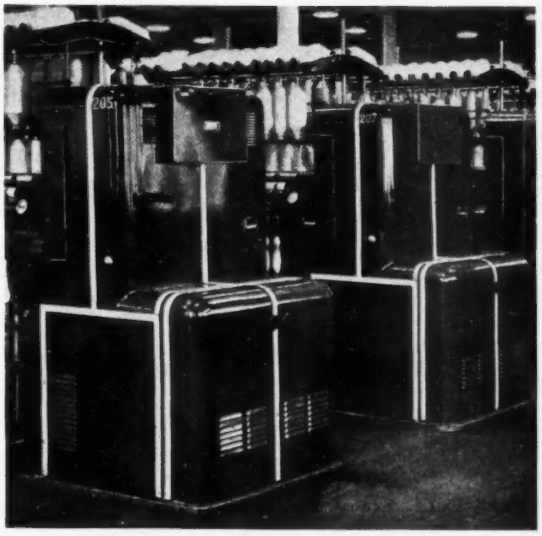

Fig. 16. Ringframes equipped with "Pneumafil" as a built-in feature. The system replaces revolving under-clearers and can be adapted to any make of ringframe

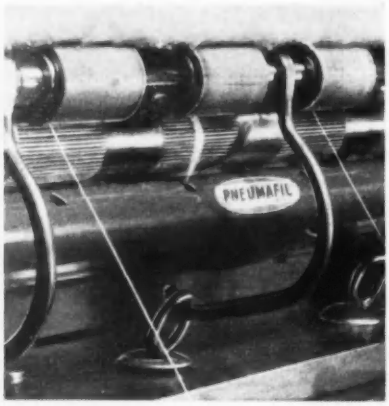

Fig. 17. Close-up of front rollers. Loose fibres and fluff are continually sucked away from the yarn as it passes over the suction apertures located at the delivery side of the rollers

various types of wool and worsted machinery, including Bradford type and French magnum type spinning frames, worsted mules and heavy carpet yarn ring frames.

Pneumatic broke-end collectors are supplied with all "P" type ring frames, produced by Tweedales and Smalley Ltd. The waste collector box and inductor fan are embraced into the design of the machines blending with the off end framing and presenting an even contour with the main structure. The ducting which connects the individual flute tubes to the collecting box lies underneath the creel at beam level, taking the place of the ordinary creel bottom. The air is drawn from the collector box by the impeller fan through a very fine mesh screen at a rate of 1,000 cu. ft./ min. Previously it was then exhausted through a perforated discharge plate directly underneath the frame at floor level.

In order to ensure that the exhausted air does not cause undue disturbance under the frame at the off end, a special air diffuser compartment is now fitted over the discharge plate. This compartment which is illustrated in Fig. 19 has its main outlet facing to the floor, with a smaller opening opposite the inlet, both of which outlets are covered with fine wire mesh. By virtue of the design of the compartment, the greater force of the exhaust air is directed downward on to the floor and satisfactorily diffused all round.

A further development is now provided in pneumatic broken-end collection by the introduction of the "Pneumaroll" system. This is also manufactured by the Carrier Engineering Co., and differs from the "Pneumafil" system in the shape of the flutes and the introduction of a revolving under-clearer, in addition to the suction device. With "Pneumaroll" the flutes are fitted with protruding plastic nozzles, which enable the suction points to be brought much closer to the nip of the front rollers, and so ensure positive collection of any broken end. The flutes are adjustable to the roller nip, in the normal manner, but in addition they can be lowered from the working position in order to provide access to the underside of the bottom rollers. To facilitate this, the flutes are supported in special spring clips which form slides for the end nipples of the flutes.

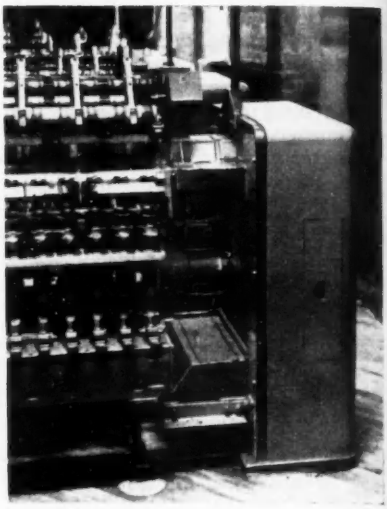

Fig. 19. View of the built-in motor and diffuser on the inside of the off-end framing, A further development is now provided in pneumatic broken-end collection by the introduction of the "Pneumaroll" system

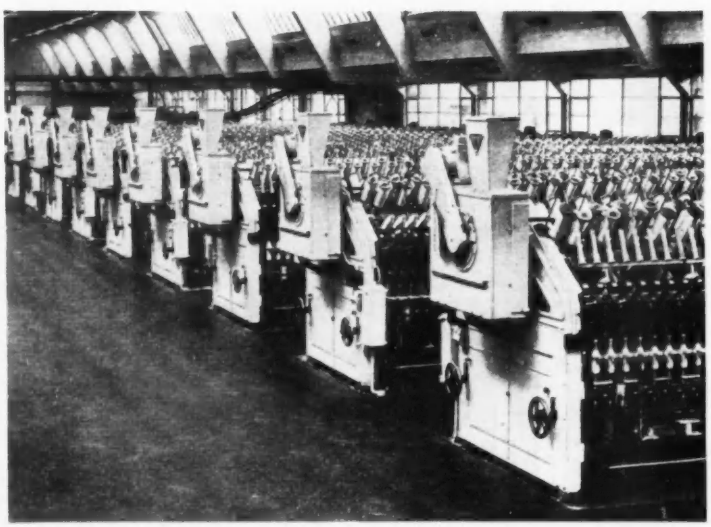

Fig. 18. Installations have been made on various types of woollen and worsted machinery

Colour — Design and Quality

Reproduced approximately one-third size, linear, the furnishing prints on the facing page are six from the ranges of high quality cloths manufactured by Bernard Wardle and Co. Ltd., Whitehall Works, Chinley. Brief details are as follows:—

(1) No. 20835. Lymm. A distinctive, large floral design in bright fresh shades of wine, pink, double-tone green, royal blue, cream and white on a light gold ground with raised woven squared effect. It is 51 ins. wide, repeating at 24 ins.

(2) No. 20142. Festival. A multi-coloured, novel contemporary print of unusual appeal and character. Repeating on 24 ins., the clean cut design appears in sharp relief on a lustrous wine coloured ground.

(3) No. 19891. Guelder Rose. A slate grey ground is the admirable setting for this fresh floral theme in white, lime green and black. Repeating on 17 ins., the cloth is 48 ins. wide.

(4) No. 20784. Helianthus. A cloth which will fit into any contemporary furnishing or decorative scheme and enhance the surroundings. Printed in shades of daffodil, light slate, light olive, black and wine, the effect is further improved on the corded white ground (48 ins. wide, repeating on 16 ins.).

(5) No. 20773. Peony. A blue/grey ground emphasises this floral arrangement in shades of russet, pink, two shades of blue, light green and olive green, cream and gold. (51 ins. wide, repeating on 26½ ins.)

(6) No. 20334. Marsh Plants. A very smart original design, supplying high key contrast on a neutral ground with weft-way corded weave at regular spacing. The design is in lime-green, olive, black and white, repeating on 24 ins. in a 51 ins. wide cloth.

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Colour — Design
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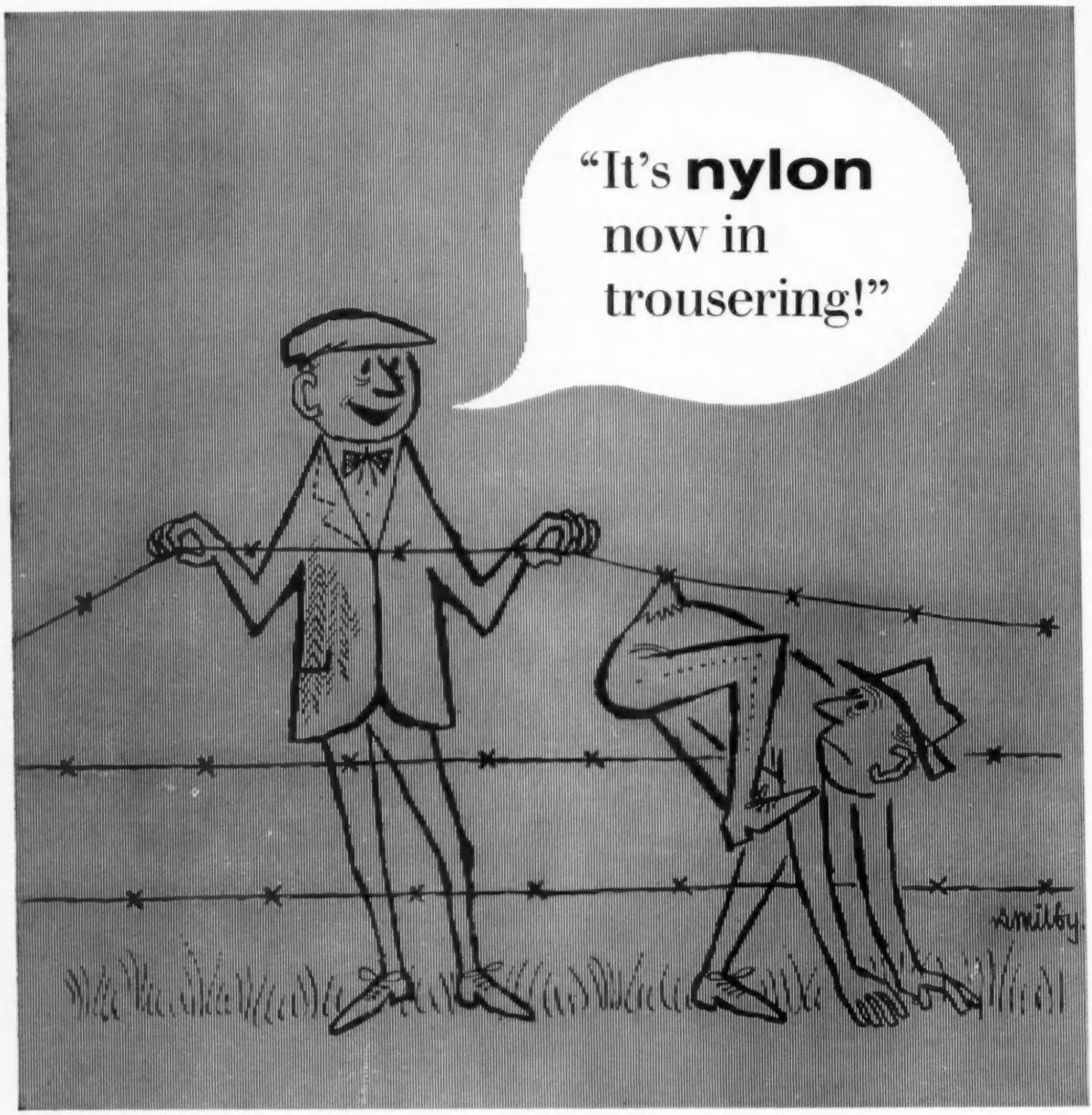

Embarrassment can be avoided—by manufacturers as well as the trousered public—if the cloth is a judicious blend of nylon and another suitable fibre. Stronger, lighter, easy to make and swift to sell, nylon-blend cloths stand the full treatment from men who are hard on clothes and from boys who are boys. Our technical people have studied the tougher trousering problem from every possible angle. Consult them any time you like.

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Fibre Structure and Dyeability

The immediate future will be concerned with the total synthesis of fibres that will have a high affinity for dyestuffs

By R. W. MONCRIEFF, B.SC., F.R.I.C., F.T.I.

ALL the natural fibres: silk, cotton, linen, wool and the other hair fibres can easily be dyed by a variety of methods; bright shades and extremely fast shades present no very great difficulty and can be obtained by well-established procedures ; sometimes a bright shade that is also very fast presents some difficulty but even such an exacting requirement as this can often be met from the wide range of dyewares that colour manufacturers offer; all other requirements are fairly easily met.

The rayons brought a good deal of trouble when they were introduced. Viscose and cuprammonium rayon although they never lacked affinity for dyestuffs did, at first, present very great difficulties in respect of levelness and fastness. Such difficulties have been overcome, very largely by *selection* of suitable dyestuffs. Cellulose acetate presented difficulty of another kind; it had very little affinity for those dyestuffs that were ordinarily applied to cellulose fibres and consequently, various devices, e.g. surface saponification of the fibre, the use of dispersed instead of dissolved dyestuffs, and the manufacture of a new range of dyestuffs, had to be adopted to overcome this paucity of affinity. Generally, though, it has for many years been true to say that acetate could be dyed satisfactorily to all reasonable requirements without very much difficulty.

The synthetic fibres have as they have come, posed an entirely new set of problems. Nylon, the most popular of the synthetics has very fortunately proved to be the least intractable to the dyer, but even so it has offered considerable difficulties. The others, the polyesters and the acrylics have presented very grave problems indeed to the dyer and a good many of them are still unsolved. Not only new devices but entirely new dyeing techniques have had to be developed to achieve a satisfactory and lasting attachment of dyestuffs to such fibres. Carriers such as some of the phenols have been added to the dyebath to swell the fibres and make them more receptive; higher and higher temperatures have been used culminating in methods of dyeing under a pressure of 10–30 lbs./sq. in., necessitating the use of totally enclosed pressure equipment; and so far as concerns the acrylics, copper in the form of cuprous ion has been used to catalyse the union of dye to fibre. Such expedients have revolutionised the dyeing process, and it is perhaps pertinent to consider why such immense changes have been necessary, whether they have proved to be adequate, and what more is likely to be expected of the dyer—what more additional capital outlay and technical difficulty are to be expected to dye fibres yet to come.

Favourable Fibre Features

Due allowance must be made for the fact that the natural fibres have been used since civilisation began and that thousands of years of effort and empirical experiment have been put into their colouration; in effect those dyeing methods that had been established by, say, 1940 had been developed expressly for the natural fibres with the single exception of the colouration of acetate fibre for which new methods had had to be introduced. All of the other rayons could be dyed satisfactorily by long established methods given that a suitable selection of dyestuffs was made and often some necessary modification of certain practical conditions.

But some of the new fibres, the synthetic fibres, could not be dyed at all by the established methods nor by many variations of them. For example, the first "Orlon," continuous filament Type 81 "Orlon," which was essentially a pure polyacrylonitrile proved to be so very difficult to dye, not only by the old established methods but even by the new methods that had been introduced as late as 1957, that production of this fibre has had to be discontinued. To what, though, are the very great differences in dyestuff affinity between the natural and the synthetic fibres attributable?

Basically there are three controlling structural factors and they are:—

(1) Easy penetration of the fibre by the dyeing medium, usually water, in which it is dyed.
(2) Complexity of physical structure which results in a large effective surface area on which dyestuffs can be adsorbed.
(3) Abundance of polar groups to which parts of dyestuff molecules eagerly attach themselves.

Penetration

Nearly all dyeing is carried out with the dyestuff either dissolved or dispersed in water, and those fibres into which water can penetrate easily do have at least the advantage that the dyestuff does find its way right into the fibre. The long molecules of cotton and viscose rayon will allow water molecules to work their way in between them, forcing them apart and causing lateral swelling of the fibre. As the temperature is raised, the mobility of the molecules increases and penetration becomes better and quicker and it is for this reason that most dyeing operations are done at high temperatures, often as near as convenient to the boil. The hair fibres behave very similarly to the cellulosic in the ease with which they permit ingress of water.

But the synthetics behave very differently indeed; their molecules will not separate laterally to allow the water molecules, and therefore the dyestuff molecules, to infiltrate between the fibre molecules.

This difficulty can be overcome by using a carrier, e.g. *o*-phenylphenol which does cause the fibres to swell, and their molecules to separate laterally and thereby permit entry of water and dyestuff molecules between them. But there is another way, probably a more important way, in which the difficulty has been mastered; it is that of taking the dyeing temperature to 110° or even 120° or 130°C. The higher temperature brings with it greater molecular mobility and the water (under pressure when the temperature exceeds 100°C.) can then penetrate between the molecules. Pressure dyeing has a lot to be said for it; it is often rapid in execution and thorough throughout the fibre and fast against light and washing, but it exacts a price from the dyer in respect

of high capital outlay and the need for skilful supervision.

Why are the molecules of the synthetic fibres so reluctant to separate one from another compared with those of the natural fibres? Mainly because they lack the multiplicity of chemical groups which bristle round the core of the molecule; hydroxyl groups in the case of cellulosic fibres, amino and carboxylic groups in the case of wool. The synthetic fibres unfortunately have few of these groups and none at all of the bulky side-chains that characterise wool. Moreover the synthetic fibres have been stretched as they were spun, or just afterwards, and the stretching has brought about closer packing of their molecules; they have packed tightly together as they were stretched. Sometimes, especially in the acrylic fibres, valency attraction, often hydrogen bonding, holds the molecules tightly together. The inclusion of side-chains in the fibre molecule would greatly reduce this effect.

Complexity of Physical Structure

Complexity of structure is associated with slowness of growth. Cotton fibres can be broken down by hammering them into finer fibrils and these, as has been shown by electron microscope studies, into still finer fibrils. The natural fibre, cotton, flax, or wool is extraordinarily complex; the wool fibre is even more complex still by virtue of the very fine overlapping scale structure which covers each fibre. The rayons and synthetic fibres have been produced at very high speeds by extruding a solution or a melt into a precipitant or a cooling medium. Often, as with nylon, the hot viscous fluid is squeezed through a circular hole into the cooler air where it solidifies. Such an exceedingly simple process affords little opportunity for the growth of a complex inner structure.

The finer the structure, the greater is the effective surface on which dye molecules can find effective sites of adsorption. There is still argument, equally amongst the dyers and the histologists with their staining techniques, as to the mechanism of colouration, but there can be no doubt that the two main processes involved are those of adsorption and of chemical affinity. In either case the large effective surface attendant on a complex internal structure is favourable for colouration, and for adsorption it is essential. It might be argued that the cellulose *rayons*, viscose and cuprammonium, have also been extruded at high speeds and that therefore they cannot have internal structures in any way comparable with cotton but that nevertheless they still dye easily. The answer is that for other reasons, notably their ready imbibition of water and their possession of many very reactive groups they pick up dyestuffs so easily, that the disadvantage of simplicity of internal fibre structure is of little consequence. But for fibres which do not excel in these other respects, fineness of structure can be a valuable attribute.

Abundance of Polar Groups

Most dyestuffs ionise in water and because the ions are electrically charged they are attracted to polar groups if there are any of these present on the molecular backbone of a fibre. The amino and carboxylic acid groups on silk and wool, the natural protein fibres, offer excellent points of attraction for dye ions; so, too, do the hydroxyl groups on the cellulose fibres, although it is the protein fibres that are really pre-eminent in this respect. But the vinyl fibres, the polyacrylonitriles, even the polyamides and the polyesters have very little of a similar kind to offer. The amide junctions in nylon afford some good sites, and the ester groupings in "Terylene" afford some, but only a relatively small number. The nitrile groups in polyacrylonitrile are plentiful but ordinarily they have only little attraction for dye ions; this attractiveness can be greatly enhanced in the "cuprous ion" dyeing technique.

A direction in which great research activity has been evident has been to include in the molecular backbone of acrylic fibres, either by co-polymerisation, block polymerisation, or graft polymerisation, a component such as an ester which carries groups that are more attractive to dyestuffs. "Acrilan" and "Orlon" Type 42, "Pan," "Dralon" and the others are examples. "Darlan," a co-polymer of vinylidene dicyanide and vinyl acetate, and "Verel" a fibre of somewhat similar type, have good affinity for many dyestuffs; this affinity has been gained by the inclusion of a component which carries polar groups; in the case of "Darlan" this component is vinyl acetate.

More and more does the research trend in the direction of more and more polar groups in the synthetic fibres—that way lies good dyeability, and often, too, softness of handle and good draping qualities. These advantages have to be paid for, and the cost is that of some loss of tenacity and durability. Fibres which are immune to mechanical shocks, to chemical and biological influences, fibres which will not swell in water, these consist of unreactive and highly orientated molecules. They cannot be easily dyed, and it is only by sacrificing something of orientation, much of closeness of molecular packing, and much of chemical and biological resistance, that an easily dyeable fibre can be made.

The Outlook

With the appearance of "Teflon," the summit of undyeability has probably been reached; here is a fibre so immune to chemicals that it can be bleached in boiling concentrated acids. It has special uses, and it fulfils these admirably, but it has no pretensions at all to being a general purpose fibre, and for its special uses, which are largely of engineering application, it does not need to be dyed.

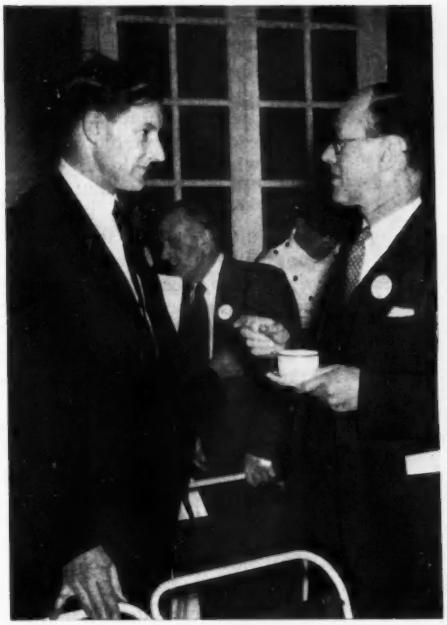
Aside from "Teflon," all the evidence is that the dyer has seen the worst and can look for better things. Emphasis has been laid for many years on the need for improvement of dyeability of the synthetics; already much has been done and doubtless much more is to be done. Fibres which have to be used for domestic and apparel purposes have to be dyed and the fibre manufacturer is alive to the need for producing something which will dye fairly readily. For the long term outlook it seems reasonable to hope that synthetic polypeptides with at least some properties that will approach closely to those of wool will appear on the market. If they do, we can be sure that their dyeing will present no difficulty so far as concerns affinity; their multiplicity of polar groups will ensure a high affinity not only for the dyestuff molecules themselves, but also for the water in which the fibres will swell, so permitting easy entry of dye molecules into the heart of the fibre. This effect will be reinforced by some degree of molecular disorientation that will attend the presence of side-chains present on the amino acids from which the polypeptides will be synthesised. The immediate future will be concerned with the total synthesis of fibres that will have a high affinity for dyestuffs. If such a trend had not come about we should have had to look forward to the greater development of "spun dyed" yarns, spun from pigmented dope, a development which would have deprived the dyer of some of his work, and would inevitably have deprived the consumers, the public, of such a wide choice of colours as they have become accustomed to.

Cotton Board Productivity Conference

Production Considerations in a Sales Programme*

Attended by over 200 directors, managers and technical experts from all sections of the cotton industry, the papers given at this conference dealt with subjects which will have an important bearing on future developments

By W. D. COATS†



l. to r. Mr. W. D. Coats (J. and P. Coats Ltd.), Mr. G. D. Hughes (Sir Jacob Behrens and Sons Ltd.)

EVERY manufacturer usually produces a variety of articles. Of this variety, some may have been on the market a long time, and some comparatively new. In order to plan the production of these articles, it is necessary for the selling side of the business to make an estimate of new orders and production must be planned in such a way as to execute these orders, when received, as rapidly as possible and in the most economical way from the point of view of the factory.

Sales, however, are not the only thing by which a business is judged. The shareholders tend to be more interested in profits and these are derived partly from sales, partly from efficient administration, and partly from efficient production. In order to achieve the latter, many well-known actions can be taken and such actions as the installation of new machinery, methods study, material handling, and re-designing of products, have been much talked about during the past ten years. However, another operation which has been less talked about but which can contribute just as much towards the efficient running of a business is a process known as variety reduction. You have all heard of rationalisation in the textile industry, but I should imagine few have heard a full and detailed definition of rationalisation. I certainly never have, but I think this process of variety reduction which I am going to explain forms a part of rationalisation. In brief, it consists of a complete survey of the range of products manufactured and sold and the elimination from that range of the least desirable. The process applies particularly to firms in which machinery can be re-set for the manufacture of different products comparatively simply, and the textile industry of this country is a potentially fruitful field of operations in this respect.

In the type of survey envisaged the sales of each individual article are valued in two ways—firstly, as regards their contribution to the total turnover, and secondly as regards their contribution to the total profit of the business. Once the turnover and profit contribution figures have been calculated, the articles are listed in such a way that the article giving the greatest contribution is put at the top, the article giving the second greatest contribution comes second, and so on down the line until the article with the smallest contribution comes at the bottom. If these lists are studied, you will probably find that a large proportion of the turnover is derived from a comparatively small number of the items listed and that there is a large number of items at the bottom of the list which represents, in each case, only a fraction of 1% of total sales. It is these items at the bottom of the list which should have attention. It is probably worthwhile examining any article which appears in the bottom 30% of either the turnover or profit contribution lists to see whether the article in question is worth retaining in the range of supply. From a study of past sales figures you will see whether the sales of individual articles are rising, static, or falling. Remembering now that we are only dealing with the items at the bottom of the list, any article whose sales are either static or falling is due for elimination without much argument, whilst those whose sales are rising should be examined with regard to their present and future profitability, and consideration given to the steps necessary to boost sales further.

The immediate effect of following this policy would appear to be merely the elimination of a number of products, with consequent loss of sales and profits. This is certainly true, but the amounts involved are very small, and the benefits to be gained infinitely greater. Diagrams in graphical form show we have surrendered approximately 5% of our turnover and 5% of our profit by eliminating 20% of the articles produced, and this loss must be recovered in order to justify the policy. The following are some of the ways by which this additional profit will be made:—

(1) Reduced changes of machinery leading to a higher percentage of machinery usage.
(2) Fewer personnel for administration and control.
(3) Reduced process stocks and stores.
(4) Reduced average cost of ancillary materials purchased.
(5) Concentration of effort on a

* *Abstract of paper given at the conference.*
† *Director of Merchandising, J. and P. Coats Ltd.*

narrower front by all personnel in both manufacturing and selling.

There are other advantages but the above are the most significant. The first four are easily understood, and probably readily acceptable, and it is No. 5 to which I would draw your attention. From the manufacturing end the benefits are somewhat nebulous, but a labour force which does not have to change its detailed operations more often than is necessary is bound, in the long run, to gain in efficiency. On the selling side the effects can be substantial.

In the textile industry we have a large variety of fibres, natural and synthetic, spanning a wide range of qualities. These can be blended together in a variety of ways to give an even wider range of cloths. The industry can be split into three main groups from the manufacturing point of view—

(1) Spinning, doubling and weaving.
(2) Bleaching, dyeing and finishing.
(3) Making-up.

In making-up there are somewhere between 10,000 and 12,000 firms of varying sizes making shirts, sheets, dresses, towels, handkerchiefs, underwear, etc., some of it being a reasonably steady trade and some highly fashionable. The main machinery used in this section of the industry consists of cutting-out machines and sewing machines and, though both go faster and faster as the years go by, each one still requires the human hand to operate it. This means that any change in variety can be dealt with comparatively simply and without any change being necessitated in the machinery installed. The change from one size to another or one colour to another, or even one style to another, can be brought about by the operator performing slightly different operations with the same machine. The case, therefore, for variety reduction is not very good though in so far as cutting-out machines can now cope with many layers of material, and in so far as there is always additional cost in buying in small quantities of materials and ancillary products, I feel that an investigation such as I have suggested would be worth while.

Turning to bleaching, dyeing and finishing, I am afraid I cannot see any advantages to be gained from a process of variety reduction except possibly in the printing section, as the problem is essentially one of lot size for a given installation, and this fact combined with the fact that a lot of the work is of a commission nature, precludes any steps being taken. Where a dyeworks forms part of a vertical organisation certain benefits can be obtained from condensing shade ranges in collaboration with the making-up department, but these advantages are mainly of an administrative and stock-holding nature rather than from a machinery utilisation point of view.

The problems in spinning, doubling and weaving are basically the same, as the machinery used is of a nature which requires considerable time to set up and a considerable time to run out when a change of quality or twist is necessary. In this country we have an industry which has been slow to catch up with new techniques, is hard pressed by competition from outside in its own home market, and is finding it difficult to compete in foreign markets. The result is under-employment of machinery, short-time working and heavy overheads, and I would not ask you to think the policy I advocate will be the complete cure to all these troubles. It will, in fact, go only a short way, but is of considerably greater significance where modern and relatively expensive machinery is being installed.

Comparative Cost

I recently had our time study and cost staff work out the comparative cost, labour and machinery-wise, between manufacturing 100 types of doubled yarn as opposed to doing the same quantity, at the same average twist, in one type. In the former case I laid down that not more than six months' requirements of any type should be made at any one time so that machinery changes could be reduced to reasonable proportions and give each frame a minimum running time of a week. This of course resulted in the necessity of carrying a substantial stock of doubled yarn but, even discounting this aspect, the cost per pound of the 100 types was 20% greater than the cost of the single type, and this was entirely due to the greater machine and labour efficiency obtained in the latter case. I am sure that if these 100 types had been processed against an order book the additional cost increase would have been even greater. I have, of course, taken an extreme example but it is indicative of the direction in which we should be working and is indicative of the cost of producing the tail end of the variety. The important thing, of course, is to reduce the number of machinery changes to a minimum but this is extremely difficult where one is dependent on an order book which is rather thin and the temptation to take what orders are going is very great. When orders are short and overhead percentages are high it is very difficult to decide whether to accept small orders involving substantial machinery changes or to go on short-time rather sooner than might otherwise be the case. Spinners are somewhat more tied in this respect, due to the difficulty of changing their mixing, which is an extremely costly operation and well recognised as such. The fact, however, remains that basically it is better to try and produce fewer types and definitely cut out the very small amounts. The total volume which they represent will not, generally speaking, make the difference between short-time and full-time but by cutting them out a very much increased efficiency will result.

Coming to the question of horizontal and vertical integration, what I have said points clearly to the necessity for individual firms in spinning and weaving to bring themselves nearer the actual consumer, and this can only be done by tying themselves up in a vertical organisation with makers-up, and I cannot see any other salvation unless artificial tariff barriers are introduced. I can also see very little pressure coming from the making-up end to amalgamate with spinners unless it be for reasons of quality or the desire to steal a march on their competitors by the invention of new and exclusive fabric formations.

Having preached a policy of not manufacturing every article your salesmen might like to sell—and I hope the idea is not too abhorrent—I should like to end by saying that my own business was built up at the beginning of this century by a deliberate policy of variety creation, and it was this as much as anything else which gave us our pre-eminent position in the sewing thread markets of the world. My forebears in their wisdom never sold identical articles in different markets for two very good reasons:—

(1) To prevent smuggling from one market to another where better prices could be obtained, and
(2) To make it more difficult for competitors to attack us on a broad front.

I think that they were absolutely right in their assessment of the situation as it then was, but with more and more countries becoming self-sufficient and banning imports, we have been left with a legacy which presents a very complicated production control problem in our U.K. mills. We still have about 20,000 stock items in our central warehouse permanently available for customers but, during and

since the last war we have drastically reduced the number of components, i.e. spools, shade ranges, etc., used to create this variety, and are now tackling the question of the different qualities and constructions of actual thread and yarn needed to satisfy the markets we can still supply, i.e. following out the principle of creating variety as far down the line as possible. One of our difficulties is that, though an item may be of relatively small production compared to our total U.K. production, it may be the main selling line in a market like Jamaica. To sum up, I would say that in certain types of business, and mainly in light engineering, a policy of variety reduction can pay handsome dividends, but in the textile field there is comparatively limited scope, partly due to the type of machinery employed and partly due to the type of market. There are, however, many different types of textile manufacturers, and you should be able to judge from the basic principles whether these principles can be applied in your own case.

Cotton Board Conference

An X-Ray of Mill Quality*

By J. H. ENTERS†

SINCE the war rapid development has taken place in the textile industry regarding assessment of yarn and cloth quality. Methods in use a long time for determining quality on a subjective basis have been largely replaced by instruments which enable us to express yarn regularity in a number; determine the number of slubs and neps and to characterise periodicity in a wave length spectrum. Nowadays most mills of any importance have a laboratory equipped with measuring apparatus on which count, twist, regularity, periodicity, fineness, etc., can be measured. This has resulted in a marked improvement in our ability to assess the quality of yarn, but it is not a guarantee which secures the elimination of quality difficulties on the mill floor. Mills having well equipped laboratories still have trouble in getting good quality out of their spinning departments. Often the quality of the yarn is poorer than could be reasonably expected on the basis of the available technical equipment in the mill. There are two reasons for this:—

(1) Not all quality troubles in the mill are reflected in laboratory figures. The number of ends down, incidence of faulty bobbins, bad piecings, excessive waste of material, etc., are not expressed in the results of the measuring apparatus above. These should be included in quality reports. Other yarn characteristics cannot yet be measured otherwise than on a laboratory scale, such as hairiness of yarn, etc.

(2) More serious is the difficulty of getting mill people to understand and make proper use of the results of laboratory tests and other quality indices which characterise the quality of the sliver and yarn produced. When in 1952 a British productivity team visited the U.S. one of its recommendations was that "means should be established to translate information into positive action."

When starting a quality control programme in a mill it is desirable to begin with a diagnosis of the situation; there is always some programme running which may or may not be improved. Even if the programme is satisfactory it is useful to check the whole situation from time to time. Such a diagnosis must give information about the technical conditions in the mill, about the way work is performed and also on numerous secondary points which may influence quality. The second step is to consider the possible remedies for unfavourable aspects of the situation. The third stage is to implement measures which aim at maintaining the remedied situation.

Mr. R. Hodara described a method of analysing ends down in spinning as a means of making a quality audit. Analysing ends down with the object of establishing the causes of the breaks is not new as many mills have been doing it for years. Mr. Hodara's method has characteristics which mean an improvement upon this type of work as it is normally carried out. Four aspects must be mentioned:—

(1) *Instruction of the Observer*—The observer is carefully instructed about the various types of yarn defects causing ends down. (An appendix in the paper gives an observation sheet for ends down studies on the ringframe. The observed ends down are grouped in 23 classes, under three headings: breaks from obvious causes (1 - 6); breaks from assignable causes (7 - 17); unknowns (18 - 20) and finally ends down effects (21 - 23). Each of these causes is described as precisely as possible in order to enable consistent observations to be made by several observers.)

(2) *Systematic Treatment of Unknowns*—When ends down observations are being made an observer has the tendency to connect every observation with a certain cause even if the facts available are not sufficient to relate the observed ends down to one of the causes. This tendency to class a great many unknowns under certain specific headings is dangerous because it tends to obscure the insight into the importance of the various causes. Roughly speaking 40% of the observations have to be classed as unknowns in most of the ends down studies.

(3) The results of the ends down studies are evaluated against the background of knowledge of the technical and organizational situation in the mill and of the machines observed. Therefore data is collected about the technical condition of the machines, about the working methods used by the spinner and other operatives and about the production organisation.

(4) One of the most important aspects of this method is the fact that it is a means of penetrating into the factory and in doing so observing closely all the production circumstances which may have a harmful influence on quality.

Results in a Particular Case

In a small Dutch spinning mill the quality control programme had to be revised. This reorganization was preceded by a quality audit. Not all frames were included in the in-

* *Abstract of paper.*

† *Consultant, Raadgevend Bureau, Ir. B. W. Berenschot, Holland.*

vestigation—only a number which could be regarded as representative. The number of spindles or heads mentioned in Table 1 were included in the observations.

Spindles/Heads	Number Observed
Drawframes	96
Rovings	1,232
Intermediates	966
Slubbers	582
Ringframes	13,742

These observations were carried out by eight persons on twelve succeeding days. Some 170 hours were spent making ends down observations. The remainder of the time was spent in investigating technical conditions and analysing the results. The most important conclusions were:—

(1) Our overall impression when carrying out this investigation was not unsatisfactory. It was apparent that much care had been given by mill supervision to various aspects of the mill, technically as well as organizationally.

(2) The ring room made a favourable impression regarding cleanliness of machines and surroundings, but the card room compared unfavourably with it.

(3) Roller settings in both departments are not entirely satisfactory. In many cases they appeared to differ appreciably from the standard given by mill management.

(4) The pneumafil tubes in many cases were not working properly, thus causing a greater number of multiple breaks than admissible when using such an installation. 36% of all ends down must be ascribed to such multiple breaks.

(5) Roller grinding should be improved. The existence of a marked periodicity in the yarn was one of the most striking shortcomings; this had a marked influence on the number of ends down and would be visible in the cloth in the form of barring.

(6) Operatives in all departments required fresh instructions on making piecings. An inspection method by the overlookers would verify if wrong piecings in the yarn were being eliminated.

(7) Cleaning rollers, etc., with knives should be prevented and better equipment supplied.

(8) Creeling methods should be improved to ensure weight control of bobbins and cops.

(9) Humidity and temperature control left much to be desired. Marked humidity and temperature variations occurred in the spinning room.

(10) The state of cans, tubes, etc., left much to be desired. This had a bad influence on the number of ends down in later stages of processing.

(11) The weight of sliver in cans and yarn on bobbins was not under control and caused difficulties in later stages.

(12) Sliver regularity from the last drawing was worse than that from the first. High irregularity of the sliver at this stage was one of the main causes of the great variations in count in the yarn. These count variations were greater than acceptable taking account of the quality of the cotton used.

(13) In view of the type of cotton used, the ends down, especially in the ring room, was much too high. It must be possible when eliminating the above mentioned disturbing factors to reduce the number of ends down to 30/35 per (1,000) spindle hours.

Follow-up of a Quality Audit

Any report brought out as the result of a quality audit contains all the information about the situation in the mill, and a report like this often comes as a shock to management. It will be realised that it is not pleasant to read a report on mill failings in which a number of overseers have spent a considerable part of their working life. We must try to ensure that the irritation caused by these critical remarks is kept at an absolute minimum. In the case of the investigations outlined, a working group was formed consisting of the overseers of the mill departments in which the results of the quality audit was discussed and in which proposals for improvement were formulated. These proposals were then offered to management and discussed. In this way it was possible to get the active co-operation of all the people concerned from the start.

Cotton Board Conference

An X-Ray of Mill Quality Part II*

By R. G. NEWBERY†

THE Productivity Centre of the Cotton Board has been engaged in various activities in quality control for the past two to three years. Most of these activities can be considered under the heading of training and this is continuing and receiving encouraging support. Recently, however, we have been considering methods of helping firms more directly by assisting in quality improvement within the mill itself. It was while consideration was being given to this that we heard of the work carried out by the R.B.B. in Holland. A good deal of their work centred on "a quality audit or mill X-ray," already described by Mr. Enters.

To investigate the method I visited Holland and was one of the team responsible for the investigations at the mill described. On my return, it was decided to carry out two experimental audits to evaluate the applicability of the method to Lancashire spinning conditions. On the basis of the results of these experiments, coupled with the experience gained in Holland, it was agreed that a decision should be made as to whether the quality audit was a suitable means of assisting quality improvement in mills and if so, in what form it should be made available.

Although for obvious reasons the

* *Abstract of paper.*

† *Cotton Board Productivity Centre.*

actual detailed results of the investigations must remain confidential, the two firms have consented to their names being made public. The first experiment took place at No. 2 mill, of J. and J. Hayes, Leigh, and the second at Stanhill Ring Co., Oswaldtwistle. At present the report to management is being prepared for the latter whilst the former has been completed and already action based on it is being taken. It would be out of place to pass judgment on this work but it is enough to say we feel sufficiently encouraged by the results obtained to carry on with the method and to make facilities available for other firms in the industry to make use of it. The details of this new service will shortly be sent to all firms in the industry but naturally, in addition, we will be only too pleased to supply any information on request.

The immediate result has been that further liaison has taken place between ourselves and R.B.B., particularly with Mr. Enters, to discuss ways of simplifying the approach. For instance, the observations in the Dutch mill lasted four hours. By reducing them to three, it is possible to get each observer to carry out two per day thus halving the number of days needed for observations. Again the recording of atmospheric conditions has been drastically reduced and cleaning inspection times made more flexible to enable the observation team to be employed more efficiently. By means of such changes it is now possible to do the job more quickly and cheaply.

Essentially the method is one which enables a mill to help itself and in view of this we favour the idea that all the collection of data be carried out by the mill staff. Data is often given more readily to people known in the mill and is likely to be more accurate when collected by people with experience of the particular mill conditions.

Normally speaking, however, the number of staff that can be spared is limited and this emphasises the need for simplification. The extent to which this has been achieved can be gauged by the fact that the observations at J. and J. Hayes were carried out by three observers assisted by a fifteen-year-old girl and took fifteen days. This was sufficient to enable each machine to be studied for nine hours and each operative for a varying multiple of that time. The training of the observers, although, as Mr. Enters has already said is vitally important, is nowhere near as difficult as imagined. The essential requirements are clear, concise instructions.

For instance in allocating end breaks by cause it is not necessary to allocate every break (even if this were possible). As long as the observer is conscientious and if, in doubt, places the break in the unknown section, it is still possible to discover the relative proportion of breaks by various causes. In the two mills there was a large variation in the calibre of observers but this was not reflected in the reliability of the results. In one mill female staff played an important part and they coped exceptionally well.

One thing essential is that a person is appointed to be on the spot to iron out the multitude of small problems that arise and co-ordinate the activities of data collection. The selection of this person is very important and in both cases we had a young man fully familiar with the mill to do this. It was, therefore, possible for us to work through him (in the actual report writing this person is present but is not made responsible for the comments made in it, for the reason that his position may be made difficult if the report is critical.)

The writing of the report judging from experiences both in Holland and this country, involves only the most simple methods of analysis. Nothing more complicated than a block diagram seems to be necessary. In fact with data collected in this way it seems to be relatively easy to trace back quality differences to the relevant technical and operating conditions. This is important because it enables the basis for the conclusions made in the report to be understood by all likely to be affected by them.

It might be useful if I make one or two observations concerning the general principles involved. The techniques employed are essentially flexible and naturally must be so to be of service to mills which differ widely both in the technical and staffing conditions. Again the actual methods of implementing changes—whether by the use of working groups as used in the example quoted or by straightforward management action — will reflect the organisational structure of the mills and the personalities involved. The thing common to a quality audit in any mill is the approach adopted and it is perhaps this newer approach which provides a clue to its success. This approach is reflected in the four main features of the audit.

First, the audit deals with all factors which affect the final quality of the product and it is not confined to the normal laboratory tests. The usual difficulty in doing this is that there are so many factors that the data becomes unmanageable. This difficulty is alleviated by building the data around investigations of one quality indicator —"ends down." It is easier to study inter-relationships between various factors if some sort of framework is available. The report itself, it should be noted, does not include a specific section on end breakage. The results of the end break observations, however, obviously appear in each of five sections.

(1) Cleanliness.
(2) Machine conditions.
(3) Operator ability and method of working.
(4) Atmospheric conditions.
(5) Yarn quality.

The position is also eased by the use of very simple methods of quality assessment such as the use of a +; ±; —; scale to evaluate such things as cleanliness and general machine conditions.

Obviously other more precise methods are employed but often the simple methods are sufficient to reveal processing or technical weaknesses. The problem is the general one of trying to comply with three aims sometimes mutually inconsistent, i.e. keeping data down to manageable proportions, getting it sufficiently

l. to r. Mr. J. Hayes (managing director, J. and J. Hayes Ltd., Leigh); Mr. R. G. Newbery (Cotton Board Productivity Centre); Mr. J. H. Enters (consultant, Raadgevend Bureau, Ir. B. W. Berenschot, Holland)

accurate to be significant and doing the job reasonably quickly with the observers available. As in all things a compromise often has to be made.

Second, the audit brings together the various groups of people who have special responsibility for quality control. It helps, in particular, to break down the division which often exists between laboratory and mill staff. This division is manifest in the fact that two quite separate control systems are built up with little co-operation between the two. The co-operation which is encouraged by the quality audit approach is likely to be continued afterwards for several of the data collection methods used can be adapted by the quality control staff to help the supervisor to keep a check on the quality aspects of his operative and machine performance. Considering quality as a whole also helps to bring the quality control and work study staff closer together by revealing the quality implications of certain work methods and work loads. These examples could be multiplied if time permitted but there is no doubt that it does help to ensure that all people in the sections are pulling in the same direction.

The third point is that the whole survey is carried out by the firm's own staff and not by outside "experts." This helps both in the collection of data and in the acceptance of the results. As all levels of mill staff have played some part in the final report there is a much greater likelihood of action to remedy particular faults being taken. The mere fact that a supervisor's or operative's opinion has been asked for, will make him or her feel some responsibility for the final recommendations. They are far more likely, therefore, to carry them out than if they were superimposed from outside. Particularly relevant is the case quoted by Mr. Enters where working groups were set up within the particular mill to present detailed recommendations. Again the data covers the good aspects as well as the bad and this is psychologically very important.

The role of the consultants in the case of Mr. Enters' organisation and the Cotton Board in ours can be regarded as a catalyst fusing together the experience and knowledge of the mill personnel. Fourthly, the mill is compared with itself and as someone has said, it is rather like pulling yourself up by your own bootstraps. Although general standards are used for comparison, e.g. count, variation and yarn regularity figures, on many aspects none are available and even if they were, would not really be suitable. Whether the mill is well equipped technically or not usually something can be done and yet it would be quite useless to compare one mill directly with the other. For instance, if one group of frames is significantly worse than the rest in some aspect then attention should be directed to those frames even though the ideal solution is to re-equip the mill with new frames. For many reasons we are often forced to make the best of a bad job.

Setting Aids in Knitting Nylon Bulked Yarns†

BULKED yarns knitted into plain structures are apt to give a striped fabric appearance. The stripes, however, are not necessarily due to features of the yarn such as different relaxation potential, denier variations or processing differences; they are frequently caused by the knitting difference between individual feeders.

Under normal factory conditions it is customary to line-up and level the feeders by a marking method in which a length of yarn in each feed position is marked when it comes from the supply package. The machine is then turned by hand and the relative lengths of yarn drawn into the machine. At each feeder the yarn is measured and compared with the others. The quality cams are then adjusted until all feeders draw the same amount of yarn.

Should stripes appear after this procedure has been carried out, yarn is often blamed for the defect. Nevertheless the stripes may still be caused by faulty machine setting. This is because the slowing down of a machine from normal running speed to the speed of turning over by hand does not necessarily maintain the relative values of the various influences on the different yarns, and in particular the effect of worn portions on cams at normal operating speeds may differ from their effect when the machine is turned by hand.

To check the actual yarn consumed by each feeder an instrument* should be used which gives the correct value either of the length of yarn consumed in a given time, or of the speed at which the yarn feeds into the machine during the knitting process. Instruments of this type are of considerable assistance in preventing striped fabric; and also in ensuring control of product uniformity, including half-hose.

When either of the recommended knitting aids is used, stitch length variation on a multiple feeder machine, or between machines, can be eliminated by setting each of the individual feed rates to one value. Should stripes remain after this they are most probably caused by differences in yarn properties.

Suitable knitting aids which have been brought to our notice are produced in the U.K. by H.A.T.R.A. and Smith Instruments Ltd. In the U.S. and in Europe the following knitting aids are available:—

(1) Supreme stitch-o-meter.

(2) Hamilton yarn meter (Scott and Williams).

(3) Rosen Silo Symkrometer, Sweden.

† *With acknowledgements to British Nylon Spinners Ltd.*

* *Suitable instruments are the yarn length counter for revolving cam box machines and the yarn speed meter for revolving cylinder machines.*

Coatings and Other Specialities

The coating and slipper cloths displayed on the facing page are a representative selection from the ranges manufactured by Armitage and Rhodes Ltd., Calder Vale Mills, Ravensthorpe, Dewsbury. Brief details are as follows:—

(1) TSC. A 12/13 ozs. mixture cloth in the miniature Royal Stuart tartan. This cloth can be produced in any of the Scottish tartans for costumes, slacks or coat linings.

(2) AFG. A 9 ozs. afgalane mixture cloth in a delightful crimson shade, but can be made in any colour.

(3) TSC. A black and white check 12/13 ozs. mixture cloth for lightweight costumes.

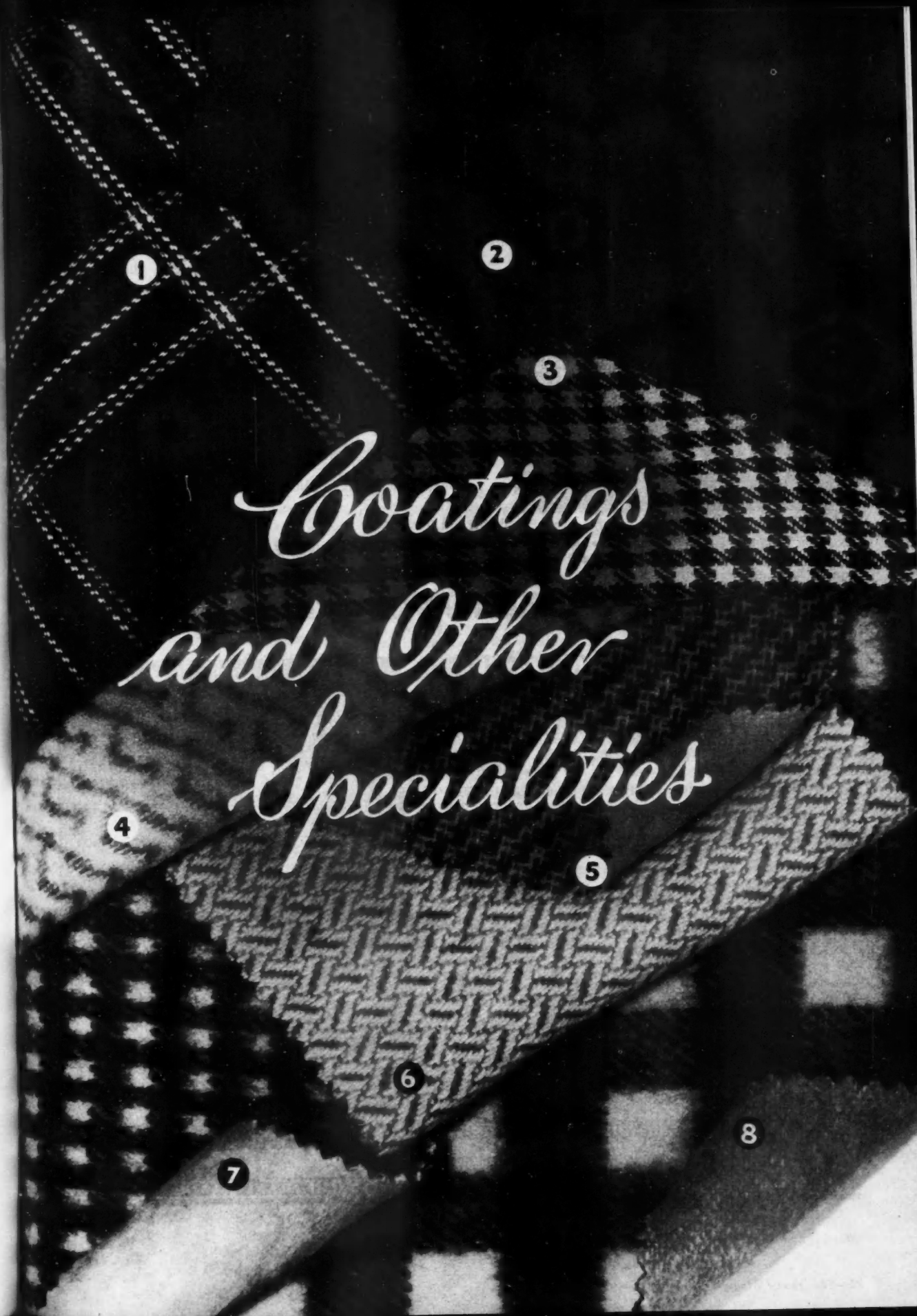
(4) BMA. A deep pile mixture coating cloth of 19 ozs. with a pastel shade background.

(5) HLC. An 18 ozs. reversible mixture coating cloth with plain back of pastel colour to tone with the face.

(6) WAG. A mixture cloth for lightweight coatings or costumes with slightly raised finish and pastel background in 16/17 ozs. material.

(7) PBA. A multi-coloured check face and plain back combined slipper cloth which is 60 ins. wide and 52 ozs./yd.

(8) PBS. A two-colour face and plain back combined slipper cloth of 60 ins. at 52 ozs./yd.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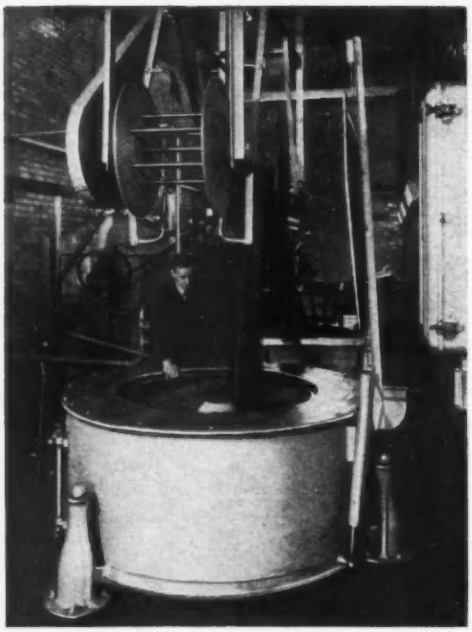

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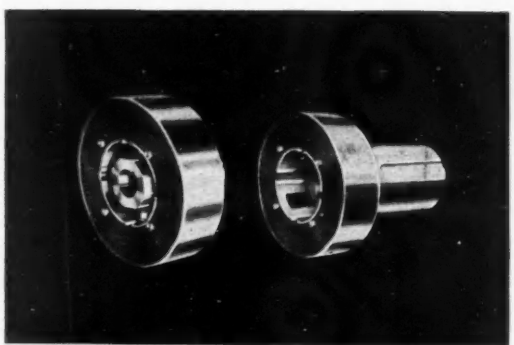

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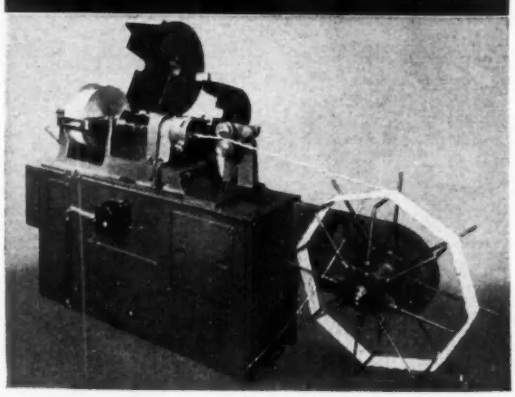

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Effect of Acrylic Blend Composition on Yarn and Fabric Processing and Performance*

By H. D. EDWARDS, PH.D., F.R.I.C., and H. SNEYD, A.T.I.†

THE truly synthetic fibres, i.e., polyamide, polyester and polyacrylonitrile, have firmly established themselves in the general textile field and their use is increasing rapidly. This review concentrates mainly on the acrylic fibre manufactured by Courtaulds and designated "Courtelle". "Courtelle" is a fairly strong fibre, of high extensibility with a dry load-extension curve whose shape is similar to that of wool. The fibre has a low water regain, although not so low as that of polyester fibre. The dimensional stability of "Courtelle" fibre is high, the residual shrinkage in boiling water of the fibres as produced being about 1%. After relaxation, the fibre remains constant in length. The low specific gravity of the fibre and its low water regain confer on it the usual acrylic-type properties of rapid drying and of bulkiness in yarn and fabric.

A fundamental property of polyacrylonitrile is its second-order transition point, or softening temperature in the region of 70°C. The effect of this change is a sharp reduction in the initial Young's modulus of the wet fibre with increasing temperature in this region. The effect is quite reversible, i.e., on reducing the temperature, the modulus rises again. However, the very high extensibility of the fibre under low loads in hot water entails problems in wet processing of yarns and fabrics made from acrylic fibres unless this factor is constantly borne in mind.

"Courtelle" Staple on the Systems of Spinning

"Courtelle" can be blended with other fibres by sandwich blending using a long feed lattice on the first hopper machine or by stack mixing. With sandwich blends, the size of the weigh should be such as to permit accurate weighing and care should be taken to spread each weigh over a given area of lattice. The components of the blends are weighed out accurately, the larger component being placed on the lattice first, the other component being spread evenly on top. The feed as a whole must not be too thick, as this may lead to weight variation in the hopper.

In drawing, rather wider than normal roller settings, especially in the front zone, are needed for good drafting and, because of the bulkiness of the fibre, the roller settings required on speed frames will be found to be rather wider than those normally judged appropriate for the staple length. Rack and lifter wheels will have to be altered to take into account the extra loft of "Courtelle." Very satisfactory yarns of good regularity and high relative strength can be spun which are soft handling, bulky and give good cloth cover. Twist factors of about 2·7 are employed for single yarn and yarn for folding, but where maximum yarn strength is the prerequisite, twist factors of the order of 2·9 to 3·2, depending upon the count, should be used.

"Courtelle" Staple on the Woollen System

"Courtelle" alone or in blend with other man-made fibres or wool can be stack-mixed in the usual manner, oiling each layer as the stack is built up. When the fibre being processed consists of material of a single denier and staple length, one passage of the fearnought is adequate. For blends of mixed deniers, two passages will be necessary, while for colour mixtures, three passages will be required. For fine yarns, 10% of a 50/50 oil/water emulsion can be used with good results. On coarse work such as 15-den. 4 ins. staple for carpets, 10% neat oil works well. 1% Cirrasol AR+1½% Syton 2S+½% Lissapol N or 1% Cirrasol AR+1% Lissapol N can be used. All three oiling methods give good results.

Any alterations made to the card when processing "Courtelle" will be due to the lofty nature of the fibre. For example, lighter weighings are found to be necessary at the hopper feed and the throw of the intermediate feed may have to be reduced. The cohesion of the fibres is excellent and there is little waste due to fly and droppings.

Drafts, as for other man-made fibres, are lower than for wool; as a guide, 1·25 to 1·3 may be used both on the mule and ring frame.

"Courtelle" Staple on the Worsted System

The preparation of "Courtelle"/wool blends takes place at the top stage. "Courtelle" top may be produced without difficulty from staple on any of the conventional worsted top-making systems and may also be made from tow on a tow-top system such as the Greenfield converter. The material has very low waste losses and may be processed using drafts, doublings and sliver weights similar to those for viscose rayon staple of similar dimensions. Tops of 100% "Courtelle" and 100% wool are blended in the required proportions in the gilling before the standard drawing sequence if the product is to be solid dyed in yarn or fabric form. If slubbing-dyed mixture shades are desired, a recombing operation is essential.

When preparing the blends, care should be taken to ensure that the scale weights are corrected for any deviation from the standard moisture contents of the materials, and it is recommended that the weighing-up should be done in sets of approximately 200 lb. per set. Each set should be run out completely from the first blending gill box before the second set is introduced and so on. In this way, the blend level can be maintained over large weights of material. "Courtelle"/wool blends are easy to process and have very low waste. Their spinning performance is good and the end-breakage rate is very low.

Preparation and Weaving of Acrylic Blend Yarns

Winding, beaming and pirning can be successfully carried out on existing types of equipment and no special

* *Abstract from paper given at the recent conference in Edinburgh.*

† *Courtaulds Ltd.*

modifications have been found necessary. Wire healds with large eyes are preferable to cotton type healds and, where possible, coarse rather than fine reeds should be used. There are no special requirements with regard to temples for "Courtelle" cloths, but perforated metal fillet on take-up rollers should be replaced with less abrasive fillet such as emery, rubber, cork, etc. Cloth construction should take into account the bulky nature of the yarn and the reduced amount of shrinkage on finishing. For a blend of 55% "Courtelle" with 45% wool, the cloth construction in ordinary circumstances should be about the same as the theoretical maximum for 100% worsted. The reed width, however, should be reduced by about 2 ins., (e.g., 66 ins. instead of 68 ins. for a suiting from slubbing-dyed yarn) and the finished yardage per piece might reasonably be expected to be one yard longer than for 100% worsted.

Knitting of "Courtelle" Blend Yarns

"Courtelle" in blends with other fibres can improve both the handle and dimensional stability of knitted fabrics. Yarns spun from blends of "Courtelle"/wool and "Courtelle/Fibro" have been knitted without difficulty on a wide range of machines. It is found desirable to knit a "Courtelle/Fibro" blend yarn under lower tension than an all-"Fibro" yarn of equivalent count, and the higher the percentage of "Courtelle" the slacker the knitting. In blends with wool, the fabric leaves the machine closer to the knitted dimensions than with all-wool yarns. Yarns spun from 100% "Courtelle" require knitting at approximately the courses/inch required in the finished fabric as there is virtually no change in courses/inch during finishing.

Dyeing and Finishing

In processing a blend of an acrylic fibre with wool, in the wet condition, there is a tendency for the wool to work to the surface. One of the properties of a blend of an acrylic fibre with wool is that it inhibits shrinkage and therefore milling shrinkage should not be sought for as this will lead only to a fabric of poor appearance.

For the full commercial development of a blend it is essential that it can be dyed by a simple process in a reasonable time for a reasonable cost. It is important, when dyeing a blend, that the dyebath conditions should be such that each fibre present will not be adversely affected by the composition of the processing solutions or by the times and temperatures involved. It is also important that, at the end of the processing period, the dimensional changes in the fabric are known and non-varying, and therefore any technique for dyeing or finishing should not be based too near any of the critical points relating to shrinkage or chemical decomposition.

Practical experience has shown that there are no unusual problems in dyeing "Courtelle"/wool and "Courtelle/Fibro" blend fabrics, but the introduction of the acrylic blend fibre has a marked effect on dimensional change. With "Courtelle"/wool blend fabrics, processes such as crabbing and steam-blowing, normally carried out with all-wool fabrics, can be employed. Scouring may be carried out in a winch machine, a dolly scourer, or with a Williams-Peace combined milling and scouring machine set for scouring. A normal worsted scour with either soap or non-ionic detergent may be used, but the temperature should not exceed 100°F.

Dyes most commonly recommended for "Courtelle" are the cationic dyes, e.g., Sevrons (du Pont), Deorlenes (Ciba), Astrazones (Bayer), Maxilons (Geigy), Basacryl (B.A.S.F.). In the case of "Courtelle"/wool blends, these dyes are applied at a pH in the range 4—6 in a liquor containing 1g/l. Lissapol N or equivalent product. When the basic dye has been exhausted, the dye liquor can be cooled and suitable acid dyes added to colour the wool. Alternatively, the wool may be dyed with milling colours and the "Courtelle" dyed subsequently in the exhausted dyebath. Finishing techniques are similar to those carried out for all-wool fabrics, but care must be taken that not too high a temperature is used in tentering, as the higher the temperature of drying the firmer and harder are the finished fabrics.

Decatising will be found to be essential for finishing "Courtelle"/wool blends, but again it is inadvisable to use steam pressures higher than 20 p.s.i. in this process since there is a danger of shade change and glazing.

With regard to "Courtelle/Fibro" blends, these should be contracted in boiling water on a chute contracting machine followed by desizing with a suitable enzyme at pH 6·5 if the fabric is made from a starch-sized warp. Dyeing can be carried out either by a one-bath method using disperse and direct dyes together, or by dyeing the "Courtelle" with cationic dyes followed by dyeing the "Fibro" in fresh liquor or exhausted liquor with direct dyes. Care should again be taken not to use too high temperatures for drying, if a soft handle is required.

Crease Resistance

The use of acrylic fibres in blends confers a number of desirable properties on fabrics made from the blend yarns. Acrylic fibres confer good dimensional stability, good crease recovery, warmth retention, resilience of handle, pleat retention and easy care. The recovery from creasing of 100% "Courtelle" fabrics is of the same order as for 100% wool. This good recovery, similarly, shows itself in blends containing various proportions of these two fibres. The crease-recovery of 100% "Courtelle" is markedly superior to that of 100% "Fibro" which has not been treated with a crease-resist resin. In "Courtelle/Fibro" blend fabrics, the effect of increasing the percentage of "Courtelle" is to increase the crease-recovery angle, and, with the higher percentages of "Courtelle", it is established that "Courtelle/Fibro" blends containing at least 50% of "Courtelle" will not require the addition of a crease-resist resin.

Stability to Washing

In woven blend fabrics, acrylic fibres have a pronounced effect on the stability of the fabrics to washing, either by hand or machine. The stabilizing effect is much more evident in the case of wool blends than in "Fibro" blends due to the effect of the acrylic fibres in inhibiting felting. The stabilizing effect of acrylic fibres on wool blends is well illustrated in

TABLE 1

Weft Composition	% Width Shrinkage During Scouring	% Width Shrinkage after Milling for			
		15 min	30 min	45 min	60 min
100% Wool	9·2	12·4	20·9	24·9	29·4
80% Wool, 20% "Courtelle" ..	6·0	7·0	12·8	16·0	21·4
60% Wool, 40% "Courtelle" ..	2·5	1·6	4·1	7·3	9·8
40% Wool, 60% "Courtelle" ..	2·5	0·0	0·5	1·0	3·6
20% Wool, 80% "Courtelle" ..	1·0	1·5	1·5	1·0	2·0
100% "Courtelle"	1·0	1·5	2·0	1·5	2·5

Table I, which gives the width shrinkages obtained during scouring and milling a series of cotton warp, wool/acrylic blend woollen-spun weft fabrics.

Fastness

Many dyeings have been carried out on blends of "Courtelle" with wool, "Fibro" and cotton. Using selected dyes, no difficulties have been encountered in obtaining level dyeings or shade matchings of required fastness. In blend with cellulosic fibres, after-treatment of direct dyes is necessary to approach the excellent wet fastness shown by basic dyes on "Courtelle." For the same reason, milling dyes should be used for the wool component of a blend with "Courtelle."

Pilling

Various blend fabrics containing acrylic fibre have been in daily wear in the form of women's skirts for several months. The blends range from 100% "Courtelle" in 25% steps to 100% "Fibro" and a similar range in blend with wool. There is no evidence of pilling in any of the blends. Men's suits made from 50% wool, 50% "Courtelle" worsted suitings have been in wear nearly two years. These fabrics have proved serviceable and there has been no pilling.

Dry-cleaning and Hoffman Pressing

Acrylic fibres in blend with other fibres can be subjected to normal dry-cleaning processes. No modifications to the process need be made and the type of dry-cleaning solvent used is determined more by the other components of the blend than by the acrylic fibre. "Courtelle" blend fabrics, when subjected to Hoffman pressing, show normal relaxation shrinkage. In these blend fabrics, the ability of the other fibres present to influence the dimension of the cloth is diminished as the percentage of "Courtelle" is increased. 100% "Courtelle" fabrics exhibit negligible dimensional change during pressing.

It is recommended that the pressure exerted at the top bed during pressing is kept to a minimum since, with undue pressure, glazing can occur and if the fabric is subjected to tension, local stretching may take place.

Pleating

"Courtelle" fabrics will take durable pleats, and may be pleated by hand or machine as is the usual practice. The preferred conditions for hand or Sunray pleating are steam pressures not exceeding 16 p.s.i. for 10 minutes. In machine pleating, the permissible working temperatures are in the region of 140°C. depending upon cloth construction. This temperature is limited as in the case of other fibres by the final appearance of the fabric, particularly as regards glazing. Pleat retention during washing is influenced by the temperature of the wash and this should not exceed 40°C. The relation between pleat retention and washing temperatures is rectilinear. Pleat retention is also dependent upon the construction of the fabric and the amount of acrylic fibre present in the blend. In wool worsted blends, the amount of acrylic fibre should be at least 60% and in blend with cellulosic fibres at least 67%.

Seam Strength

Many blend fabrics have been tested for seam strength and resistance to slippage and in all cases these have been found adequate. Generally, blends containing the higher percentages of acrylic fibres show the best seam strength and resistance to slippage, and such treatments as proofing do not materially affect the results.

Resistance to Abrasion

Acrylic blend fabrics show resistance to abrasion suitable for their intended end uses, e.g., women's dresses or men's suitings. In a comparable series, the 100% wool broke down at 16,000 rubs on the Martindale tester, while the "Courtelle" blend fabrics all withstood more than 20,000 rubs.

Blends of acrylic fibres present an opportunity and a challenge to the textile trade to develop new markets and to set new standards of performance over a wide range of products. Fine yarns, bulk with lightness, dimensional stability, cross-dyeing, thermally-induced finishes and bulking through controlled shrinkage provide great possibilities for the fabric designer working in close collaboration with the dyer and finisher.

Textile Institute Annual Conference

Fibre Distribution in Blended Yarns*

By A. E. DE BARR, B.SC., F.INST.P., and P. G. WALKER, B.SC.†

THE purpose of blending is, initially, to produce yarn with qualities that cannot be obtained by using one type of fibre alone. Occasionally, blending may be practised for the sake of the novelty value of a blend, but, more properly, the objective will be to produce yarn having one or more particular physical or chemical properties in the most economical manner. Ultimately, however, it is the properties of the fabric woven from the yarn that are important. Consider, for example, colour of cloth. The average colour of cloth woven from yarn spun from a blend of differently spun-dyed fibres will be determined by the proportions of the differently coloured fibres on the surface of the yarn. This, in turn, will depend upon the proportions of the differently coloured fibres in the blend, and upon the arrangement of fibres in the yarn. But the appearance of the cloth depends not only upon the average colour, but also upon the variations in colour from place to place in the cloth. For example, long-term variations in the proportions or arrangement of the surface fibres, particularly in weft yarns, might produce bars or streaks, whilst short-term variations can give rise to a speckled appearance. It is necessary, therefore, to consider, not merely average blend proportions and fibre arrangement, but also the way in which these quantities vary along the length of the yarn.

Where properties such as cloth strength are concerned, however, somewhat different considerations apply. Although cloth strength is influenced by many other factors, we are concerned chiefly with its relation to yarn strength and, other factors

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* *Abstract from a paper given at the conference.*

† *British Cotton Industry Research Association.*

remaining the same, cloth strength will depend upon yarn strength. Now in so far as the stress is uniformly distributed across the section of the yarn, the average strength of a yarn will depend only upon the proportions and properties of the constituent fibres (although any variations in the composition of different sections of the yarn will lead to irregularity of yarn strength). Evidence that this is at least approximately true is provided by the results of strength measurements on yarns containing different proportions of two constituent fibres which show that, within certain limits, yarn strength can be predicted from the blend proportions. But, if the core region of the yarn differs in composition from the rest of the yarn, then, depending upon the elastic properties of the component fibres, the stress in the yarn may not be uniformly distributed across each section, and the average strength of the yarn will depend also upon the average fibre arrangement.

Relationship Between Yarn and Cloth

Some information about the relationships between fibre properties, blend proportions and fibre arrangement on the one hand, and yarn and cloth appearance and properties on the other hand, can be obtained theoretically, but a full understanding of the subject demands an experimental investigation of these relationships. Furthermore, it is necessary not only to know the relations between fibre arrangements and yarn and cloth properties, but also to know the relationship between fibre arrangements and the details of the production of the yarn. The opening treatment given, the number of doublings and the nature of the spinning process can all influence the fibre arrangement.

Blend proportions and fibre properties are, in principle, easy to measure, but there is no obvious way of measuring fibre arrangement. It is clear that if the relationships are to be elucidated, it will be necessary to measure all factors involved and that fibre arrangement will have to be studied in detail. Objective measurements of many yarn and cloth properties are relatively easy to make so that the outstanding requirements for a knowledge of blending are:

(1) the development of a suitable method or methods of specifying and measuring fibre arrangement in blended yarns;

(2) the study of the relations between fibre properties, blend proportions and fibre arrangements, and processing conditions on the one hand and yarn and cloth properties on the other hand.

The aspects of fibre arrangement that are important are (a) fibre arrangement in any part of the yarn, and (b) variation of this arrangement along the length of the yarn. The actual arrangement of surface fibres in a yarn will be determined to some extent by the arrangement in the roving as produced by the various preliminary blending and drafting processes, but will also be influenced by the insertion of twist on spinning. It is convenient, therefore, to distinguish three types of fibre arrangement that are of interest:—

(1) fibre arrangement in short lengths of the yarn surface;
(2) fibre arrangement in the cross-section of the yarn;
(3) fibre arrangement across the section of the yarn before twisting.

It should be noted that of these, (1) and (2) can be considered as linear arrangements of fibres whilst (3) is essentially a two-dimensional arrangement, although the problem can be simplified by considering the yarn as being composed of a core plus surface fibres.

The sort of information that is required about blending is then as follows:—

(1) The effect of fibre properties and processing, in particular the number of doublings and the amount of drafting, on fibre arrangement. (It has been shown that the action of opening machines can be treated in terms of an equivalent number of doublings.)
(2) The effect of processing, in particular the action of machines at which fibres can be lost and the number of doublings and the amount of drafting, on blend proportions and on variations in blend proportions.
(3) The effect of fibre arrangement and of variations in fibre arrangement on the appearance and physical properties of yarns and cloth.
(4) The effect of variations in blend proportions, both short-term and long-term, on the appearance and physical properties of cloth.

If information of this kind were available, it would be possible to relate yarn characteristics and processing conditions to the end-product desired.

Suggestions for Further Work

Knowledge of how to blend to produce the desired results is still far from complete. In particular, much systematic work is needed on the relations between processing conditions, cloth appearance, and fibre arrangement. For the study of the distribution of fibres across sections of a yarn there would appear to be no complete alternative to the cutting and preparation of cross-sections of the yarn, although the actual determination of the fibre arrangement in these sections could probably be carried out using one of the methods outlined for the measurement of fibre arrangement on a surface. In addition, indirect methods of measurement might be made to give some information. For example, a comparison of the breaking strength and elongation of short lengths of yarn, in the twisted state and then after untwisting, might be correlated with the radial distribution of the component fibres.

Analysis of blend proportions through the bulk of the yarn can be made chemically, but some alternatives to the chemical method might be more convenient. An estimate of the mean composition of a two-component blend can be made by measuring the stress—strain relation of the yarn. The air-flow, for a given pressure drop, through the yarn could also be used for the determination of blend proportions, particularly if the two components differed in denier. Yet another possibility is the use of capacity-type regularity testers on slivers, rovings, or yarns made up from component fibres of different dielectric properties. Even if the dielectric properties of the two fibres are not greatly different in the normal state, there is the possibility of treating the yarn in some way so as to increase the difference between them. As an example of how this could be done, it is pointed out that the indications of capacity-type regularity testers can be very sensitive to the moisture content of the yarn. Since different fibres absorb different amounts of moisture from the same atmosphere, there is the possibility of arranging the atmosphere of the testing room so that a measure of the blend proportions can be obtained. It should also be possible to measure blend proportions in the yarn itself by making one component fibre radioactive. The distribution of radioactivity along the yarn would then indicate the concentration of that component.

Effect of pH in Bleaching

The pH value is a factor of major significance in all bleaching processes and this article discusses its importance in chlorine bleaching of cellulose, hypochlorite bleaching, the stability of hydrogen peroxide solutions, continuous peroxide bleaching and peroxide bleaching of wool and silk

By "TECHNICAL CORRESPONDENT"

HARDLY any factor in bleaching is of greater importance than pH value which, for different bleaching agents, may be varied within wide limits. For example sodium chlorite is perfectly safe so far as the cellulosic fibre is concerned at pH 4 and 70°C. while under similar conditions with hypochlorites the fibre would be completely disintegrated. Hypochlorites on the other hand may operate under a much wider range of pH value than any other bleaching agent with simultaneous control of time, temperature and concentration of bleaching agent. Chlorites operate effectively from 4-4·5 at a temperature range of 160-200°F.

The difference between peroxide and hypochlorite solutions is well known with regard to pH value. Peroxides are very stable at low pH with increasing instability as the pH rises. On the other hand, hypochlorites show greatest instability at low pH with increasing stability as the pH increases. It has been stated by eminent authorities that as recently as the 1920's and 30's the importance of pH value in bleaching practice was not so widely appreciated as it should have been. This point will become abundantly clear on perusal of the following notes as it is very evident in every case that pH value is a factor of major significance in all bleaching processes.

Chlorine Bleaching of Cellulose at Low pH

The following abstracts from Jnl. Soc. Dyers & Col. Sept. 1948, p. 327, gives some indication of how pH value may be varied with changing techniques to produce improved qualities of the product. For example prevention of low viscosity or degradation of the bleached material as well as improved resistance to yellowing:—

"Hercules Powder Co. B.P. 601,290. Reduction of the viscosity of cellulosic material when bleached with Chlorine from an aqueous solution of pH 1·5-4·5 is inhibited by adding to the liquor a compound containing hydrogen directly attached to nitrogen, e.g. ammonia or chloroamine, in the proportion of 0·2-20 pts. per million expressed as molecular equivalents of ammonia based on the weight of the solution."

"Hercules Powder Co. and L. L. Bertram, B.P. 601,643. Very pure cellulose fibres of viscosity up to 70-80% of that of the untreated fibres, low soda-soluble content and less tendency to become yellow with time are obtained by giving a chlorine bleach at pH 1·5-4·5 with a liquor containing 0·1-100 parts per million of ammonia or the equivalent of another compound containing at least one hydrogen atom directly attached to nitrogen followed by treatment with an alkaline non-oxidising solution, e.g. 0·01-1% aqueous caustic soda, at 135°F. for 45 mins. If desired a second chlorine bleach may be given, or several chlorine bleaches alternating with alkali treatments may be given in which case the last treatment should be with chlorine."

The ideas in the foregoing abstracts are based upon the facts that the chloroamines activate chlorine at low pH as well as having a buffering effect which keeps the bleaching action at these pH values under control and prevents degradation of the cellulose.

Combined Use of Low and High pH in Chlorine Bleaching

In an abstract of B.P. 601,645 Solray & Cie. (Jnl. Soc. Dyers & Col. Sept. 1948, p.327) it is stated that:—"A better bleach and stronger fibres are obtained by treating cellulose fibres, particularly retted fibres, for a short time in an aqueous solution containing 1-4 g. of active chlorine per litre at pH—3 and 20°C., then, with or without rinsing, in aqueous sodium hexametaphosphate or sodium sulphamate at 20°C., the liquor being maintained at pH 10·5-11·5 by addition of sodium carbonate, and finally in an aqueous solution containing 0·5-2·5 g. of active chlorine per litre at pH—3."

In this case, the buffering effect of fibre impurities would seem to have been brought into play in the early stages of very active bleaching at low pH, the activity of bleaching being continued at a slower pace at the higher pH of the second stage. The use of sodium hexametaphosphate is interesting at this stage as it is an observed fact that this compound has a slight but pronounced accelerating effect on the rate of bleaching under alkaline conditions. Without further information it may be surmised that the final stage at low pH is a short treatment followed by washing, etc.

Bromine as Catalyst in Hypochlorite Bleaching

In B.P. 596,192 and 596,153 particulars are given of the use of bromine in the form of potassium bromide as a catalyst in bleaching cotton and vegetable fibres with hypochlorite. It is stated, according to "Technologist"[1] that the use of bromine in this manner has largely been overlooked, and that it is now possible to make use of potassium bromide as an addition to hypochlorite liquors, to increase the bleaching activity of the solution by something like 50%. It is stated that it is possible by this means to double the rate of bleaching and, at the same time, bring about an increase of 50% exhaustion of chlorine from the bleach liquor.

From the point of view of pH value it is known that hypochlorite liquors act more quickly at low pH than high pH, but are much more difficult to control at lower figures and for this reason a high pH is generally used. In the present circumstances it is

known that bromine as catalyst can be safely used at pH 10 to pH 11 which is strongly alkaline but it is further pointed out that better results so far as speed and exhaustion of the bleach liquor are obtained by working at pH 7·0 to 8·2, when it will be found that the results are entirely satisfactory as judged by normal cupramonium fluidity testing.

Effect of pH on Hypochlorite Solutions at Raised Temperatures

In a discussion on continuous bleaching and preparatory processes F. W. Thomas[2] made reference to accelerated hypochlorite bleaching at raised temperatures. During the lecture it was stated that with increase of temperature it was possible to accelerate the hypochlorite bleach very considerably, and it was pointed out that this rise of temperature did not lead inevitably to rapid decomposition of hypochlorite solution if a high pH was used. For example, it was pointed out that if the pH was maintained above 11 a hypochlorite liquor could be boiled without undue loss of chlorine.

Bleaching With Sodium Chlorite

It is well known that sodium chlorite can give very good results in bleaching at low pH under specified conditions. The main points claimed for its use are (a) minimum weight loss, (b) freedom from tendering due to the fact that cellulose is not attacked by the chlorite but only the impurities and colouring matter of the grey cloth, (c) good handle and absorbency. For example bleaching can be carried out on grey cotton before or after kier boiling with as little as 2% chlorite at a temperature of 70°C. The pH value is controlled at 3·5 to 4·5 preferably with organic acid such as formic. The two main disadvantages of chlorite bleaching are the evolution of poisonous fumes of chlorine dioxide and corrosion of metals by the chlorine dioxide. The first may be overcome by adequate ventilation and the second by the use of special stainless steel equipment and chemical inhibitors such as sodium nitrate.

Influence of pH on Chlorites

Useful information of the influence of pH on the decomposition of chlorites under bleaching conditions is provided by White, Taylor and Vincent[3]. These authors state that decomposition of chlorites in acid solution yields chlorine dioxide and chlorate in a molecular ratio which is generally greater than 2 : 1, and is practically independent of conditions. It is further pointed out that the rate of decomposition is largely dependent on pH, temperature and concentration and that reaction between chlorites and hypochlorites or chlorine varies with the pH value. The main reaction in the latter case and in acid solution of chlorine dioxide followed by slow formation of chlorate with reduction of chlorine dioxide evolution.

An interesting point refers to the effect of formaldehyde and other reducing agents on sodium chlorite at pH7. It is noted that chlorine dioxide is liberated under these conditions, at which sod. chlorite would normally be stable and the risk of corrosion be considerably less. Acetaldehyde and ferrous sulphate are specifically mentioned as suitable reducing agents.

Use of Chlorine Along With Chlorites

According to B.P. 519,522 of the Mathieson Alkali Works—incidentally one of the early patents in this field of bleaching studies—the value of the use of chlorine along with chlorites is stressed. It is claimed and emphasised that if chlorine is added to a bleaching solution of a chlorite the final bleaching action is characteristic of the chlorite rather than the chlorine. In other words the tendency of chlorine to degrade the cellulose by excessive oxidation is overcome and the chlorine instead of attacking the cellulose catalysis the chlorite as it were, with liberation of chlorine dioxide resulting in effective bleaching without degradation of the cellulose. A typical chemical equation is suggested as follows:—

$$Cl_2 + 2\,NaClO_2 \rightarrow 2\,ClO_2 + 2\,NaCl.$$

The proportion of chlorine to chlorite should be within the range 25-30% of the available chlorine content of the chlorite used and should not exceed 50%, otherwise it is probable that the favourable balance of the reaction may be disturbed. It is further noted that the reactions can be carried out under a wide range of pH values, at the same time emphasising the dangers of corrosion involved by the use of high temperatures and low pH.

Bleaching Cotton Cloth with Sodium Chlorite and Hypochlorite

It is claimed that very good results as regards fluidity can be obtained by employing a mixture of sodium hypochlorite and sodium chlorite in a ratio of 1½ : 1 in terms of available chlorine used at room temperature. From the present point of view it is important to note that strict control of pH value is not of the first importance though it should be kept within reasonable limits. A recommended method is as follows, using kier boiled cotton:—The cloth is impregnated with the bleaching solution at room temperature and stacked for 6 hours followed by washing and anti-chlor. Wash again and dry.

pH Control. The pH of the solution is maintained at from 8·7 to 9·0 during the bleaching operation if a period of 30 minutes is used. For a 2 hour bleach a pH value of 9·2-9·4 is recommended, and for a 6 to 12 hour bleach pH 9·7-10·0. The feature of the higher pH with longer periods is that it prevents the available chlorine from being too quickly exhausted. Regulation of the pH is by use of appropriate mixture of sodium bicarbonate and sodium carbonate, and is tested in the ordinary way by means of an electrometer of pH test papers.

Claims are made for this method that the catalytic effect of the chlorite upon the hypochlorite makes use of the cheapness and bleaching activity of the latter with reduced risk of damage to the material and a greater ease of control by regulation of the pH value as already indicated. This point of view may be borne out by Table I given in the article[4] from which the foregoing information has been extracted.

Table 1—Breaking Strength

Hypochlorite Bleach Warps		Chlorite-Hypochlorite Bleach Warps
75·5	Warps	77·8
72·1		76·3
95·0		132·0
60·3		68·2
62·4		75·6
63·0	Weft	64·2
61·2		66·5
91·0		95·0
56·8		58·1
66·0		83.4

Hypochlorite and Chlorite Bleaching of Cellulose Pulp

In U.S.P. 2513787 claims are made for increased efficiency and savings in bleaching cellulosic materials, particularly wood pulp by the use of a mixture of hypochlorite and chlorite with special reference to the technique of pH control for the purpose of using both bleaching agents in the

most efficient manner. The general method is to control the bleach liquor at the beginning of the bleaching period at pH 9 which has the effect of inhibiting completely the action of sodium chlorite. When the progress of the reaction indicates that all the hypochlorite has been utilised, the pH is lowered to 4 thus activating the chlorite by which the bleaching action is completed without any risk of detriment to the stock.

It should be noted that this technique is in keeping with ideas expressed elsewhere in the present notes that the impurities present in raw cellulosic materials have the effect of stabilising and buffering oxidising solutions used in bleaching. In view of this it is likely that the cheapness and high oxidising activity of hypochlorites can be made use of in such processes in the early stages, the chlorite being brought into play when the risk of cellulosic degradation by excessive hypochlroite bleaching begins to appear, as it is well known that chlorites do not attack the cellulose but only natural colouring matter.

Effect of pH on the Stability of Hydrogen Peroxide Solutions

Outlining developments with bleaching with hydrogen peroxide, Wood and Richmond[5] have pointed out that it had long been held as an important point in the stability of hydrogen peroxide solutions that appreciable quantities of acid should be present. This is now known to be unnecessary and a graph illustrating this point of view shows that under pH 6 the evolution of oxygen from pure hydrogen peroxide 100°C. is negligible. Over this figure it begins to rise more or less as follows: Evolution of oxygen at 6·5 pH is = 2·5% at 7 pH, at 7·25 pH 12%, with the curve rising steeply.

The same authors have summarised the study of the effect of certain catalysts on the rate of decomposition of hydrogen peroxide, particularly in the presence of iron at different pH values. In the presence of very minute quantities of iron, e.g. 0·1 p.p.m. the highest rate of decomposition was observed at pH 3, using a pure high strength solution of hydrogen peroxide. In a curve illustrating this point oxygen evolution in the presence of traces of iron as indicated showed about 14% at pH 2 rising rapidly to 26% at pH 3 and falling again with rising pH till stability of the solution was reached at pH 5. This experiment was again carried out at 100°C. on pure high strength hydrogen peroxide solution. It is noted that the same principle would probably apply from more dilute solutions in the presence of metallic catalysts.

Continuous Peroxide Bleaching by the Pad-Steam Method

In a description of the continuous pad-steam method of peroxide bleaching developed in the U.S., Stubbs[6] has drawn attention to many important features in the process. From the present aspect of pH it is mainly of interest to note that the fabric saturated with the peroxide solution containing approximately its own weight of 1 vol. hydrogen peroxide and up to 1% of sodium silicate is subjected to a steaming treatment in the J-box at a pH between 10 and 11. Care must be taken to remove all residual alkali by thorough washing before entry into the peroxide saturator, to avoid an excessive rise in pH value with consequent instability of the peroxide solution.

Another point made during the course of the lecture was that unless the pH value was kept fairly high there was a tendency to deposit silica on the sides of the stainless steel J-boxes. This resulted in resistance to the movement of the fabric through the J-box and eventually caused rub-marks on the goods if allowed to build-up excessively. While it was known that high pH would reduce the incidence of this trouble it was noted that most bleachers preferred to work as near the critical value of pH 10 as possible.

In a further description of the continuous J-box method of peroxide bleaching the following particulars are given:—After the caustic treatment the goods are thoroughly washed and saturated in a peroxide solution of liquor containing 1% peroxide, 1·4 to 1·5% of sodium silicate 42 deg. Be. and 0·1%-0·15% of caustic soda at a pH of 10·8-11. The goods are saturated at room temperature and impregnated to hold 100% of liquor before being passed into the J-box for steaming. The steaming is carried out for 60 minutes at 100°C. or as near as possible. It is pointed out that oxygen is evolved slowly under the conditions of steaming, temperature and pH and the bleaching action is completed in the specified time.

In this description again the matter of thorough washing at all stages receives special emphasis, not only from the point of view of the removal of all impurities prior to entry into the bleaching bath, but also for the prevention of carry-over of alkali into the bleaching stage and consequent possible variations in pH value.

Effects of Silicates on the Stability of Peroxides

Interesting information is supplied by Campbell[7] in Tables 2 and 3 reproduced herewith regarding the effect of silicate on the stability of hydrogen peroxide solutions as compared with solutions, the pH of which is controlled by the use of caustic soda only. Both solutions are maintained at a temperature of 180°F. and the time factor is that required to bring about 50% decomposition of the peroxide solution. It is pointed out that peroxide solutions are most stable under acid conditions and cannot be used for bleaching purposes until they are made alkaline with caustic soda or other suitable reagent. It was further noted that solutions made alkaline with caustic only were very susceptible to catalysis by the presence of minute traces of metallic ions.

Table 2

Rate of Decomposition of One Volume Hydrogen Peroxide Solution at 180°F.

pH	Time required for 50% decomposition
6·8	3·2 hours
7·1	2·8 „
7·9	2·2 „
8·9	1·2 „
9·9	25 mins. (approx.)

Add just sufficient caustic soda to maintain pH to above solution.

Table 3

Rate of Decomposition of One Volume Hydrogen Peroxide Solution at 180°F. Containing 7·2 Grains per Litre Sodium Silicate. (pH adjusted with NaOH or H_2SO_4)

pH	Time required for 50% decomposition
6·0	3·75 hours
7·0	3·5 „
8·0	11·0 „
9·0	5·5 „
9·6	4·0 „
10·5	1·5 „
12·0	10 mins. approx.

A comparison of the two tables shows that sodium silicate is much more effective than caustic soda as a stabiliser expecially in the range 8·0-10·5. In a later note this writer draws attention to the effectiveness of grey cotton impurities as stabiliser and suggests that the best combination for peroxide bleaching is sodium silicate and grey cotton. This effect is applied in practice in one-stage

bleaching of cotton piece-goods. For most purposes the pH value in cotton bleaching is maintained between 9·8 11·0.

Continuous Peroxide Bleaching—Azoic Dyed Yarns

Campbell[7] mentions pH in relation to the peroxide bleach stage of the continuous bleach process and draws attention to the need for careful control. For example impregnation with peroxide should be in a 0·5-1·0 vol. hydrogen peroxide solution stabilised and buffered with 1% sodium silicate 82°F., pH 10·5-10·8. The goods being stored in the steam stage or J-box for 30-60 mins. An interesting point is made in relation to yarn dyed goods—with azoic dyes—where it is emphasized that the caustic treatment should be omitted and two peroxide stages given instead. The variation is in the pH value which is kept slightly lower at 10·0-10·4—the indication being that a rather lower alkalinity should be maintained for azoic dyed goods to prevent bleeding during bleaching. The temperature of bleaching should also be kept rather lower at 190°-195°F.

Animal Fibre Bleaching With Peroxide

According to B.P. 347292 raw wool which has been scoured may be bleached with hydrogen peroxide at low pH—on the acid side 3-6·5 by a drying process. The method is outlined as follows:—Raw wool is fed from an opener into the first bowl containing soda ash at 120°F., squeezed and thence to a second bowl containing soda ash and soap, squeezed again and into bowl three which is supplied with soap only. It is then rinsed well for removal of alkali and thence to peroxide solution at 120°F., pH 5·4, adjusted by sulphuric acid. On leaving the acid peroxide bath the wool is squeezed as dry as possible and allowed to dry slowly on a conveyor belt at 120 to 140°F. Bleaching is said to be completed at this stage and no further washing is necessary, as presumably there can be no trace of residual alkali to damage the wool fibre.

Effect of Varying the pH in Peroxide Bleaching of Wool

In a study on the effect of hydrogen peroxide in oxidising wool Smith and Harris[8] showed that the extent of oxidation depended upon concentration temperature and pH of solutions and time of treatment. In a special reference to the effect of varying the pH on the oxidising solutions it was stated:—"Results indicate that the pH of the hydrogen peroxide solution has no appreciable effect on the oxidation of wool by peroxide by below about pH 7. Between pH 7 and 10 the alkali solubility increases and the cystine content decreases with increase in pH. Above 10 the cystine continued to decrease but the alkali solubility also decreased. This is due to the fact that above pH 10 the alkali concentration in the hydrogen peroxide bath becomes sufficiently high to dissolve in subsequent alkali treatment. When the loss in weight in peroxide treatment is added to the loss in weight in the alkali treatment, the total loss in weight is in better agreement with the decrease in cystine content."

Peroxide Bleach for Dark Wools

A so-called "stabilising-catalysing" treatment for dark raw wool, e.g. alpaca, cashmere, camel hair, goat hair, etc., is claimed in B.P. 745,941 (Harris Research Laboratories Inc, U.S.A.)[9]. The treatment which consists of subjecting the wool to the action of formaldehyde in the presence of a ferrous salt and preferably a reducing agent is said to bring about chemical stabilisation of the keratinous material of the wool fibre to such an extent that it may afterwards be subjected to severe bleaching treatment with peroxides.

The presence of a reducing agent is said to have a specially good effect on the reduction of the disulphide linkage of the cystine group with good levelling of the iron salt and thorough penetration of the latter into the keratin in the region of pigmented material. It is presumably this penetration of iron salt into the darkest coloured regions of the fibres which assists the bleaching action at the second stage of treatment.

An example is given:—250 lb. dark Alleppo carpet wool was treated in a stainless steel kettle total capacity 1900 litres. *First bath*—3·5 lbs. ferrous sulphate; 1·1 lbs. citric acid; 0·35 lbs. sodium-sulphoxylate-formaldehyde; 11·1 litres formaldehyde solution (40%); 0·9 lbs. Triton × 100. Treat for 1½ hours at 82°C. and pH adjusted to 5·5 to 6·0 with acetic acid. Rinse twice for 3 mins. at 43°C. and bleach as follows:—16·8 lbs. oxalic acid; 42 lbs. tetrasodium pyrophosphate; 29·4 lbs. sodium carbonate; 16·6 gals. hydrogen peroxide 120 vol. Commence at 55°C. and after 1 hour add 2 lbs. soda ash to maintain pH at 8·2. Bleaching is continued for a further 2 hours with a final temperature of 60°C. and a total bleaching time of 3·5 hours. Liquor ratio varies from 10 : 1-40 : 1 or more to suit equipment. In both cases careful maintenance of the pH values within the specified ranges is essential for the production of consistently good results.

Silk Bleaching with Peroxide

The use of hydrogen peroxide is common in bleaching natural silk—weighted and unweighted. Alkalinity is important and should be carefully controlled to avoid damage to the silk. Recommendations are oxygen content 1·6 to 2·5 grammes per litre for 5 to 6 hours at 160°F.-180°F. at pH 10 maintained by use of ammonia. Free alkali should never be permitted in silk bleaching baths and alkalinity in either de-gumming or bleaching kept under pH 10·25 in all circumstances. Piece goods bleaching is normally carried out in open vessels so that the progress of the reaction can be kept under survey.

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(8) **Smith and Harris:—Oxidation of Wool: Effect of Hydrogen Peroxide on Wool. Tex. Man. July, 1936, p.278.**
(9) **Harris Research Laboratories Inc. U.S.A. B.P. 745941. Peroxide Bleach for Dark Wools. Dyer and Tex. Prin. May 25, 1956, p.877.**

Canada:

National Packaging Exposition

The 7th Canadian National Packaging Exposition will be held in the Automotive Building of the Canadian National Exhibition Grounds, Toronto, November 4 to 6, 1958. The type of goods to be shown will include all forms of packaging materials and equipment; various methods of packaging will also be illustrated. Total attendance at the 1957 event was estimated at 15,000, comprising buyers or official representatives able to influence buying. U.K. manufacturers who contemplate exhibiting at this show should instruct their agents as soon as possible to approach the organisers, the Packaging Association of Canada, 1 St. Clair Avenue West, Toronto, 7.

Oiling of Mesta

Results and discussion of some recent experimental investigations carried out to ascertain the effects of oiling on the processing of mesta

By K. K. CHATTERJEE, P. K. SAHA, K. K. BHOWMICK, S. B. BANDYOPADHYAY*

MIXING mesta with jute is now widely practised in the Indian jute industry for the manufacture of hessian and sacking the proportion, of course, depending chiefly on the quality of the end product. The application of oil in the form of batching emulsion is an essential requirement in jute processing and considerable work has been reported on various aspects of the oiling of jute [1, 2, 3] but no such work has yet been published on mesta. The present investigation, however, relates to the effect of oiling on the processing of mesta.

A commercial sample (Plassey CN Mesta bottom—J5845) of mesta fibre was taken for these experiments. Individual samples, 13 lbs. each, were selected from representative lots of fibres, which were made by mixing and sampling thoroughly, reed by reed, from two half bales and subsequent re-sampling. In this manner 50 test samples were made at a time. Each sample was allowed to stand for conditioning in a standard laboratory atmosphere for two days before the experiment and a portion of it (350 g.) was taken for ascertaining the moisture regain values. Mineral batching oil, normally used in the jute industry, was employed. The emulsion with different proportions of oil and water was prepared in an emulsification plant on the day of experiment. The emulsions were stable; in each case the stability of the emulsion was noted.

All experiments were carried out in duplicate, the second one being performed immediately after the first on the same day. For each experiment, 12 lbs. of fibre were taken and the emulsion subsequently applied by means of a spray gun. The material was then passed through the softener once and processed and spun into yarns of nominal grist, 10 lbs./spyndle, with the same set of existing jute machinery with the same dollop, drafts and doublings as in T.R.L. standard spins.[4] The spindle speed and the twist of the yarns were 3,600 r.p.m. and 3·43 t.p.i. respectively. The humidities were also recorded during spraying, carding and spinning.

The estimation of oil and water content was carried out on samples collected at four stages of processing, i.e., breaker sliver, finisher sliver, second drawing sliver, and yarn, each in duplicate, one on the sample collected at the beginning and another at the end of each experiment. The oil was estimated after extraction of the samples in a soxhlet apparatus with petroleum ether (b.p. 60°-80°) for about five hours; the extracted fibre was dried in an oven at 105°C. to a constant weight.

The card droppings after collection were conditioned for two days at 65 ± 2% R.H., weighed and calculated as a percentage on the de-oiled, oven-dry fibres fed. The number of spinning breaks were recorded over a period of spinning 10 full spinning bobbins on the same set of five consecutive spindles selected from the spinning frame. The yarns were conditioned at 65 ± 2% R.H. and tested for grist, strength-grist ratio or quality ratio (Q.R.) and the co-efficient of variation of the weight (wt.c.v.%) of 2-in. yarn pieces.

Fibres are not generally stacked or binned in the industry and to cope with the facilities and programme of the spinning trials, the fibre samples after application of the emulsion were not binned. However, to start with, experiments were carried out to observe what effect, if any the binning treatment had on the quality of the yarn and the results are set out in Table 1.

In addition to this, three series of experiments were carried out to study the effect of different amounts of water and oil applied on mesta at various stages of processing. In the first series, the amounts of water added varied from 10-30% and the oil was kept constant at 5% on the weight of air-dry fibres but in the second series the amount of water added was kept constant at about 25% whilst that of the oil applied varied from 0-15%. The last series, however, was concerned with the experiments in which both water and oil had been varied (water from 8 to 32% and oil from 2 to 8%) by applying different amounts of emulsion of the same composition. The results of the experiments in duplicate (three of which were spoiled during the oil and the water estimation) are given in Tables 2, 3 and 4.

Results and Discussion

The percentage of oil and water applied to the fibres has been calculated on the basis of de-oiled oven-dry fibres from the amount of emulsion applied (from the difference in weight of fibres before and after spraying), the known composition of the emulsion and the moisture regain values. In view of the possible irregularities in the take-up of adhering oil in the machinery by the raw fibres, which varies from 0·2-0·4% and as no separate data could be obtained for emulsion-treated fibres, this has not been taken into account. The moisture and the oil contents have also been calculated on the basis of de-oiled oven-dry weight of fibres, from the initial weight of the processed samples collected, oven-dry weight of the said sample after de-oiling and the weight of the oil estimated. The figures for oil content have been corrected for natural fat and wax of mesta, which is about 0·18%.

Table 1 shows there was no marked difference in the Q.R. of the yarns between the binning and non-binning treatments but there were less spinning breaks when the samples were binned. This, however, supported the earlier observations of Bandyopadhyay and Sarkar on jute.[5]

* *Technological Research Laboratories, Indian Central Jute Committee.*

Table 1

Test No.	Moisture Regain %	P.C. of Oil Applied	P.C. of Oil Estimated				P.C. of Water Applied	P.C. of Moisture Estimated				P.C. of Card Droppings (Conditioned)		No. of Yarn Breaks in Spinning (Per 10 bobbins)	Grist lbs./spyndle	Q.R.	Wt. c.v. %	R.H. %		
			Breaker sliver	Finisher sliver	II Drawing sliver	Spun yarn		Breaker sliver	Finisher sliver	II Drawing sliver	Spun yarn	Breaker	Finisher					At Spray	At Card	At Spinning
							Binning for 2 Days													
6441	14·5	6·57	4·81	4·55	4·44	4·39	26·28	33·73	29·32	27·98	23·99	3·2	3·8	12	9·2	67±1·6	31	77	74	74
6442	14·5	6·46	5·11	4·51	4·43	4·33	25·84	34·18	30·71	28·78	23·81	3·6	3·9	5	9·0	69±1·2	31	77	68	75
							No Binning													
6451	14·9	6·23	5·04	5·15	4·91	5·00	24·92	34·00	33·19	31·45	25·92	3·1	3·2	18	9·0	68±1·7	28	76	76·5	77
6452	14·8	6·22	4·75	5·28	5·21	5·21	24·88	32·40	32·28	30·40	22·98	3·6	4·4	39	8·4	60±1·7	31	77	76·5	75·5

Table 2

Test No.	Moisture Regain %	P.C. of Oil Applied	P.C. of Oil Estimated				P.C. of Water Applied	P.C. of Moisture Estimated				P.C. of Card Droppings (Conditioned)		No. of Yarn Breaks in Spinning (Per 10 bobbins)	Grist lbs./spyndle	Q.R.	Wt. c.v. %	R.H. %		
			Breaker sliver	Finisher sliver	II Drawing sliver	Spun yarn		Breaker sliver	Finisher sliver	II Drawing sliver	Spun yarn	Breaker	Finisher					At Spray	At Card	At Spinning
6380	16·5	5·47	4·20	4·42	4·54	4·14	10·94	21·55	20·97	19·89	17·12	3·0	4·0	44	9·5	61±1·1	30	77	77	76
6381	16·3	5·26	4·55	4·25	4·24	3·96	10·52	21·89	20·58	19·46	17·17	3·1	4·0	57	8·8	53±2·2	36	77	77	74
6398	13·6	5·48	4·12	4·22	4·10	4·32	16·44	24·27	22·81	21·49	17·95	3·3	3·4	20	9·4	62±1·2	30	76	75·5	76
6399	13·6	5·19	4·43	4·33	4·13	4·02	15·57	23·44	21·58	20·12	17·27	3·4	4·1	17	9·2	59±1·7	29	76	71	76
6404	15·1	5·05	4·38	4·21	4·06	4·09	20·20	26·58	24·69	23·07	19·11	3·2	4·5	9	9·3	66±1·4	27	68	71	74
6405	16·3	5·34	4·50	4·37	4·24	4·35	21·36	28·19	25·40	23·53	19·31	3·1	3·8	7	9·5	67±1·4	27	71	74	77
6464	12·2	5·53	4·43	4·15	4·02	3·93	27·65	29·65	27·44	25·50	20·77	3·1	3·6	5	10·3	68±2·5	28	72	66	72·5
6465	13·6	5·04	4·83	4·41	4·24	4·25	25·20	32·66	27·90	25·84	19·07	3·5	4·3	8	9·0	60±1·2	31	72	72	70
6455	15·1	5·32	4·39	4·37	4·28	4·21	31·92	38·76	36·16	34·42	27·39	3·1	4·0	28	8·8	66±1·2	32	77	76	77·5

Constant Percentage of Oil Applied

It is evident from Table 2 that there was a reduction of oil content at the breaker card, the oil-content of the fibre thereafter remaining more or less constant as there was very little further reduction up to the yarn stage, the final loss being about 1%. On the other hand, loss of most of the water applied was due to evaporation and the amount of water retained by the yarn increased with the increase in the applied water under more or less similar humidity. The variation in the amount of water applied within the range did not appear to have any effect on the card droppings; 20-25% of the added water appeared to be necessary for satisfactory spinning performance as shown by the yarn breaks and Q.R. of the yarns.

Constant Percentage of Water Applied

It will be observed from Table 3 that samples containing no added oil show an oil content of 0·24-0·39% at the various stages. This oil had obviously been taken-up by the fibres from the machines and retained in processing. The table also shows that on varying the amount of oil applied from 2·8 to 6%, the loss of oil was not more than 0·4%, but with a further increase in the amount of oil applied, the loss of oil increased up to an extent of 2·5%. Regarding moisture content, it might be said that roughly about 65% of the applied water was lost at the yarn stage when the prevailing humidities varied from 70-75%, but at lower humidities the loss was somewhat higher. It also appears from the table that mesta can be spun with water only, but a higher number of yarn breaks in spinning resulted in a loss of production. The application of 6-9% oil, however, considerably reduced the yarn breaks, but with any further increase of oil the quality of the yarn tended to deteriorate as shown by increased yarn breaks and fall in quality ratio. On the other hand, applied oil did not seem to have any effect on card droppings.

Variation in Oil and Water Applied

Table 4 indicates that simultaneous increase in oil and water applied resulted in loss of lesser amount of oil compared to previous cases. It will also be seen from the table that 6-7% oil and 24-28% water are necessary for satisfactory spinning and yarn quality. Further increases in the amount of oil and water applied did not show any beneficial effect. When the applied water and oil were rather low (2% and 8% respectively), the yarn quality was very poor.

Conclusion

Taking into consideration the regain and the humidities prevailing during processing, the following conclusions might be drawn:

(1) Mesta can be spun after addition of 25% water only, but the yarn breaks are considerably high, resulting in higher costs of production.

(2) The addition of 8-16% water together with 2-4% oil did not

Table 3

Test No.	Moisture Regain %	P.C. of Oil Applied	P.C. of Oil Estimated				P.C. of Water Applied	P.C. of Moisture Estimated				P.C. of Card Droppings (Conditioned)		No. of Yarn Breaks in Spinning (Per 10 bobbins)	Grist lbs./spyndle	Q.R.	Wt. c.v. %	R.H. %		
			Breaker sliver	Finisher sliver	II Drawing sliver	Spun yarn		Breaker sliver	Finisher sliver	II Drawing sliver	Spun yarn	Breaker	Finisher					At Spray	At Card	At Spinning
6466	12·9	nil	0·39	0·26	0·24	0·26	25·92	31·12	30·36	25·72	22·69	3·9	4·5	90	9·1	59±1·3	30	75	75	76
6467	11·1	nil	0·35	0·21	0·23	0·29	25·51	32·02	30·43	25·89	20·58	4·0	4·7	63	8·7	61±1·3	28	75	75	76
6502	13·3	2·79	2·79	2·69	2·58	2·51	23·22	29·70	25·62	23·05	17·91	4·1	4·4	30	9·7	60±1·3	28	62	62	64
6503	12·9	2·78	2·80	2·93	2·82	2·77	23·14	28·06	26·95	23·24	17·48	3·6	4·4	18	9·3	64±1·3	26	63	62	64
6514	12·9	5·92	5·77	5·56	5·52	5·61	24·70	29·27	27·02	24·88	18·91	3·5	4·2	20	10·1	62±0·8	29	64	64	64
6515	12·9	6·04	6·37	5·73	5·66	5·65	25·15	31·81	26·88	24·41	18·47	3·6	4·1	9	9·8	60±1·7	32	64	65	65
6533	12·9	9·36	7·39	6·99	6·79	6·79	25·99	34·57	31·07	29·15	22·15	3·5	4·1	13	10·0	65±1·1	29	73	73	67
6541	12·2	12·90	10·31	10·80	10·89	10·73	26·90	31·91	31·96	30·26	22·99	3·6	4·4	28	9·9	61±1·2	29	59	70	68
6542	12·0	12·50	10·93	11·33	11·06	10·90	26·05	33·26	31·48	29·41	21·50	3·5	4·5	20	9·5	55±1·6	29	70	70	68
6553	14·2	15·88	14·38	15·34	15·10	14·99	26·46	32·09	30·71	28·69	22·59	3·9	4·4	23	9·8	58±1·3	29	70	70	62
6719	11·8	14·88	13·90	13·72	13·68	13·37	24·80	25·61	23·36	21·16	14·06	3·8	4·4	24	10·7	54±1·1	30	60	63	54

Table 4

Test No.	Moisture Regain %	P.C. of Oil Estimated: P.C. of Oil Applied	Breaker sliver	Finisher sliver	II Drawing sliver	Spun yarn	P.C. of Water Applied	P.C. of Moisture Estimated: Breaker sliver	Finisher sliver	II Drawing sliver	Spun yarn	P.C. of Card Droppings (Conditioned): Breaker	Finisher	No. of Yarn Breaks in Spinning (Per 10 bobbins)	Grist lbs./spyndle	Q.R.	Wt. c.v. %	R.H. %: At Spray	At Card	At Spinning
6564	12·2	2·11	1·28	1·25	1·25	1·25	8·44	17·59	16·97	16·50	14·93	3·6	4·4	64	9·2	46±0·8	31	63·5	65	65·5
6565	11·8	2·10	1·41	1·26	1·16	1·47	8·40	16·84	16·74	16·44	13·77	3·9	4·6	56	10·1	45±1·1	38	65	65	66
6576	12·9	4·02	4·31	3·76	3·73	3·85	16·08	24·72	23·58	22·59	14·96	3·9	4·3	78	9·5	55±0·9	35	64	66	65
6577	12·5	4·34	3·85	3·83	3·89	3·79	17·36	24·59	24·66	23·92	15·99	4·3	4·3	40	9·1	58±1·3	26	64	64	62
6587	14·4	6·32	5·39	5·75	5·62	5·71	25·28	28·08	30·86	28·59	20·75	4·2	4·1	20	9·8	63±1·1	30	64	64	63
6588	12·9	6·29	7·70	6·84	6·83	6·71	25·16	31·21	26·12	25·72	19·82	3·8	4·3	18	9·7	64±0·6	28	64	63	62
6433	15·9	7·25	6·29	6·09	6·06	6·19	29·00	36·88	34·66	32·47	26·34	3·4	3·8	13	8·9	64±1·4	29	70	72	76
6434	15·5	7·48	6·22	6·39	6·34	6·33	29·92	37·84	36·79	34·59	23·94	3·0	4·8	24	8·3	63±2·1	30	72	72	76
6599	12·7	8·10	9·03	9·01	8·73	8·86	32·40	36·09	33·30	29·75	19·60	3·7	4·8	42	9·2	59±1·3	32	63	64	66

improve the spinning performance, also the Q.R. of the yarns was low.

(3) The limits for applied oil and water appeared to be 5-9% and 20-25% respectively.

(4) Variations in the percentages of oil (0-15%) and water (8-32%) had no appreciable effect on card droppings, which were about 8%.

(5) Binning treatment applied to fibres after application of oil and water appeared to show a little (about 3%) improvement in the Q.R. of yarns.

Acknowledgment

Thanks are due to Dr. P. B. Sarkar, Director, Technological Research Laboratories for his kind interest and suggestions.

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Textile Institute

Modified Continuous Filament Yarns

ALTHOUGH since 1945 many ideas had been developed, few had been fully exploited commercially in connection with modified continuous filament yarns, stated Mr. D. F. Arthur, B.Sc., A.Inst.P. (British Nylon Spinners Ltd.) in a recent address to the West Riding Section of the Textile Institute. There were well over 100 known patents and applications dealing with the yarns, he said, but so far only five basic types had been successful and these were: (*a*) twist, set, untwist crimped, (*b*) edge crimped, (*c*) stuffer box crimped, (*d*) air blast bulked and (*e*) stretch monifilament. For many reasons the production rates of all these yarns were somewhat different and the rates for the major types were set out in

Table 1

Yarn	Speed f.p.m.	Production 70 den. lb./spindle/168 hr. week
"Ban-Lon"	375	20
"Taslan"	300	16
"Agilon"	130	6·9
Twist-set—untwist conventional methods	—	less than 1
False twist method		
Spindle speed 30,000 r.p.m.	31	1·65
Spindle speed 60,000 r.p.m.	62	3·3
Spindle speed 120,000 r.p.m.	125	6·6

The production rate of the false twist crimped yarns was determined by the spindle speed obtainable. Most machines had spindles operating at up to 40,000 r.p.m. but the Heberlein false twist machine had special spindles operating in air bearings which it was claimed, enabled speeds of 120,000 r.p.m. and more to be achieved. In many instances the aim in developing a modified continuous filament yarn had been to obtain a wool-like handle or generally to imitate a spun yarn in some particular. In fact, the consequence of many of the processes had been to produce a range of unusual properties notably elasticity and surface properties, said Mr. Arthur.

An interesting aspect of the lecture was concerned with surface characteristics. It was frequently observed that some fabrics felt cold while others felt warm and this could be analysed in terms of the properties of the fibre, yarn and fabrics involved. Comparison of the tactile sensation produced by, for example, a piece of plastic and a piece of metal showed that the metal felt very much colder. Both substances were assumed to have the same smooth surface. In fact, the metal had a higher thermal conductivity and in the first few instants of contact with the skin removed more heat from it than the plastic did. If now the experiment was repeated with two pieces of metal, one polished and one knurled, the polished metal felt colder than the knurled. Here the properties of the material were the same, but the surface was different; the real area of contact between the polished surface and the skin was greater than that of the knurled surface and the skin. Consequently, the polished surface could remove heat faster than the knurled surface. This was comparable to the comparison of a fabric woven of a continuous filament yarn and one woven of a spun yarn. The spun yarn fabric had the lower real area of contact and consequently felt warmer. Fabrics might be compared by a simple experimental apparatus consisting of a copper disc 1 in. dia. and ·030 in. thick polished on one surface and mounted horizontally on insulation so as to have a small and constant heat loss. The disc was provided with a thermocouple to measure its temperature. The temperature of the disc was raised about 20°C. above room temperature by applying a warm brass weight and the weight replaced by a piece of the fabric under test. The fabric was held flat by a small weight and the temperature of the disc noted as a function of time. The fabric woven of continuous filament yarn reduced the disc temperature to half its initial value in about 17 secs., whereas the spun fabric and that woven of "Taslan" yarn took about 35 secs., for the same temperature drop. It might also be shown that over 65 secs. was required for a knitted fabric of false twist crimped yarn to produce the same effect. It was apparent, therefore, that the air blast bulking process produced a yarn with surface characteristics very close to those of a spun yarn.

The difference in structure of the various bulked and stretch yarns was shown by the water absorption properties of the yarns, under conditions where an excess of water was present. Table 2 sets out the percentage water absorption in skeins of yarn which had been immersed for several hours in water and on removal allowed to drain for a specified time.

Table 2

Yarn	Absorption %
False twist crimped—	
1 den. per fil.	1779
2 den. per fil.	1651
3 den. per fil.	1567
"Ban-Lon" high bulk	1010
"Ban-Lon" normal bulk	875
"Agilon"	906
"Taslan"	588
S.A.A.B.A.	1135
Spun 1/12s c.c. nylon	350
Continuous filament 2 den. per fil.	355

Cutting Terry Towels from the Woven Length

In the methods described, an experienced operative working on piece rates will cut 200 to 300 dozens of single cut towels in 8 hours, or 500 dozens of three-in-a-width face towels in the same time

By T. HARGREAVES

TERRY towels are usually woven with a fancy heading border at each end. Sometimes other weaves that are non-terry weaves and which often employ mercerized, dyed or other types of fancy yarns, are used in these borders to enhance the appearance and increase the sales value. On the contrary no special weave or fancy yarns may be used when weaving these fancy borders or headings. In such a case the weave will be the ordinary basic terry weave but woven without producing any terry loops in contrasting bars with other portions of the cloth consisting of terry loop fabric.

Whatever the type of heading woven on the ends of the terry towel it is extremely important each specimen is an exact replica of the rest in length, width and weight. To facilitate this, the designer usually arranges for a clearly marked line to be woven into the fabric at a point exactly between the last heading of one towel and the first heading of the next. This is known as the cutting line and there are many ingenious ways of weaving it without having recourse to drop boxes, or complicated procedures.

It is along this cutting line that each towel is severed from the roll of terry cloth. Cutting these towels in superimposed form is not a practical proposition in face of the difficulties involved in pairing the headings. Each towel must, therefore, be cut from the roll by a separate cutting action. For many years large type manually operated, scissors were used to do this cutting process and scissor wielding operatives were certainly adept at their job. Today, however, several makes of cutting instruments are available, some small and light, others larger and, of course, heavier. The heavier types are equipped with small rollers in the base so that they can be run forwards or backwards by the operative without having to lift them from the surface of the cutting table.

These cutting instruments consist of a steel disc cutting blade, driven by a fractional h.p. motor which is an integral part of the cutting instrument. These very efficient instruments are equipped with a pair of small carborundum wheels set at the correct angle to grind a razor sharp edge on the circular cutting blade without the necessity of having to remove it from the instrument. Suitable guards supplied by the instrument maker shroud the cutting blade and effectively prevent accidents to the operative. It is excellent mill practice to examine the guards before allowing any instrument to go into service.

In one instance the guards were found to be inefficient in the eyes of the factory inspector but it was quite a simple matter, however, to solder extra covers on to the existing guards to ensure that the instrument conformed to the required degree of safety without in any way detracting from the efficiency of the instrument when in use. Below the blade is a base

Cutting towels one at a time from 120 yds. rolls of terry cloth by means of an electrically driven rotary cutting instrument. This carries a very small mechanical counter easily operated by the thumb of the operative after each cutting stroke. In this manner, an accurate count of all towels dealt with is obtained, and each towel as it is cut passes to the left and lies over the rail attached to the table

(Below) A sketch of the cutting table

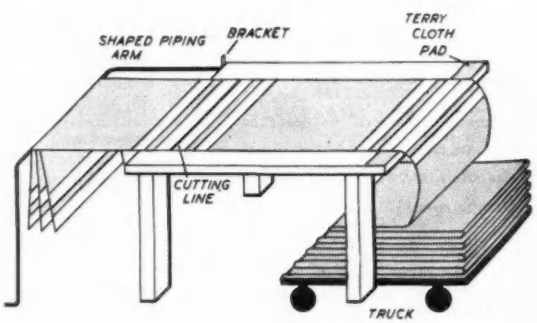


plate serving as a stand when the instrument is not in use, and which also acts as a slide on the cutting table as the operator makes the forward and back stroke when severing the towel from the roll. The well protected flex carrying the current to the motor of the instrument should descend vertically from above and never at any time touch the top of the cutting table. It is a simple precautionary measure to ensure that the electric cable is not accidentally severed by the blade of the cutting instrument.

Production

An experienced woman operative using one of these electrically driven cutting instruments will cut single towels from the cloth lengths so quickly and accurately along the cutting line that the subsequent operation of hemming is helped considerably. If the cutting is to be done through a fringe instead of along a cutting line the fringe will be evenly cut all along without any semblance of raggedness common to scissor cut jobs. A production of 200/300 dozens of singly cut towels in 8 hours is usual for an experienced cutter working on towels up to 24 ins. wide and, of course, larger and wider towels will take proportionally longer. It is not uncommon when cutting small face cloths from rolls of three in a width to achieve figures of 500 dozens in 8 hours. These figures do not include folding, which is done as a separate process. To raise the efficiency in this operation it is important to ensure that the table is set at the correct height to suit the girl or woman engaged on the job. The table should be about 4 ft. long and about 3 ft. deep but the depth will be more if wider towel widths are to be cut. From the floor to the top of the table is usually about 30 ins.

The surface of the table should be made from non-splinterable material and "Masonite" is one material used in the American continent. There will however, be some British materials of a similar nature eminently suitable and "Formica" should be an ideal substance in that it is available in many pleasing colour arrangements, is smooth and will withstand rough usage. At the right-hand side of the top of the table and running from front to back a pad made from Terry cloth, 3 ins. wide and about ¾ in. thick is secured. This prevents the material falling back on to the low truck holding the say "120 yds. length" of terry material lying in folds on the truck when a towel is severed from the length.

At the left-hand side of the cutting table a metal bracket is secured to the framework just below the table top and as near to the back as possible. This bracket is for the purpose of holding a ¾ in. o.d. galvanized length of piping, shaped in such a manner as to provide an arm on which the towels are placed as they are cut one by one from the length of terry cloth. One end of the pipe is bent backwards about 3 ins. at an angle of about 90° and it is this portion which slides into the metal bracket attached to the table. From this bracket the pipe should project about 14 ins. in a line to the left, parallel with the floor, and just below the height of the table top. At this point the pipe is bent forwards towards the line of the front of the table and parallel with the left side of the table top. Now in line with the front of the table it is then bent downwards to be supported by the floor.

If a flat metal plate can be welded to the part resting on the floor it does provide additional stability. The whole of this shaped length of metal tubing is easily removed from the table on occasions when it is not required. The fact remains, however, that this fitment is almost as valuable as an extra pair of hands and arms.

The operative selected for this job of cutting the towels proceeds in the following manner:—

(1) The low flat truck holding the uncut towel length of cloth is wheeled half way under the right side of the table.

(2) With her left hand the operative pulls the end along the top of the table and further to the left until it hangs over the shaped pipe length.

(3) The cutting line is now about 6 ins. from the left-hand side of the table top.

(4) Standing in the gap between the left-hand side of the table and the shaped piping she makes a deft cut along the cutting line with the cutting instrument held by her right hand.

(5) The first towel is now severed from the cloth length and is now draped over the arm of the shaped pipe length.

(6) Because the terry towel pad fastened to the right-hand side of the table top prevented the cloth to be cut from moving, the end, left after the first towel was severed, is now lying about 6 ins. from the left edge of the table top.

(7) The operative takes hold of this end with her left hand and pulls the cloth along until when released by her, it will fall over the arm of the shaped pipe on top of the previous towel. As before, the cutting line is now about 6 ins. from the left-hand side of the table top; ready in place again for the next cutting stroke.

Automatic Counting

At this stage it is worth considering an extra aid to efficiency in the shape of a small, precision counting attachment fitted in such a manner that a small lever can easily be depressed by the thumb of the right hand when holding the handle of the cutting instrument. The operative becomes quite expert in this dual single handed operation of cutting the towels and depressing the lever automatically after the cut has been made. As she carries on through the piece the counter registers 1, 2, 3, 4 etc., in sequence so counting the total of towels cut from the fabric length. If required, the tiny counter can be reset to zero after each length of cloth has been cut.

A machine is available which will feed the cutting line to the position for cutting. When cut, the towel is carried away and hung over an arm in much the same manner as the towels were hung over the arm of the shaped piping in the table method. It is carried there by a moving apron. The movement of the cloth length stops whilst the operator severs the towel along the cutting line, using the same type of cutting instrument as that employed in the table method. The movements of the machine are controlled by a series of electric scanners which operate in a similar way to the automatic opening and closing of doors by persons breaking the beam of light to effect the operation. Where cloth widths and lengths are all equal and no resetting of the timing of the movements is involved this machine is very efficient but if the widths and lengths of the towels vary from one extreme to the other it does take appreciable time resetting the movements of this machine. Length variation of towels is extremely prevalent in the terry towel trade and this certainly creates much loss of time when cutting is done with the aid of such a machine. These and other factors are considerations which manufacturers themselves must study in order to formulate the best system to fit in with their methods of manufacture and system of working.

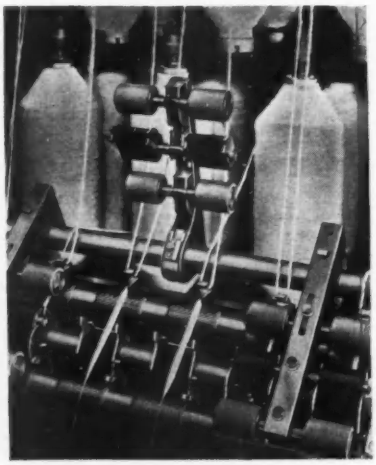
TEXTILE MACHINERY and MILL EQUIPMENT NEWS

The New Casablancas GX2 System on Ringframes

The top arm in this new system marks an important advance in the technique for guiding and weighting the rollers

THE new methods of holding, guiding and weighting the top rollers of ringframes have definitely come to stay. Their essential feature is a member extending across the drafting field and over the centre of the top rollers, the old type of weighting arrangements and cap bar fingers and nebs being dispensed with. As happens whenever a novelty meets with initial success, development work on these methods has been intense throughout the world, each new design constituting an effort to incorporate all the lessons so far learnt from the practical results of the earlier models.

The top arm of the Casablancas GX2 system marks an important advance in this new technique for guiding and weighting the rollers. As will be observed from the illustrations, the new arm is quite small and extremely low, thus overcoming one of the disadvantages generally met with top arm weighting systems, namely, that the bulk and height of the arm make it necessary to use small, short top clearers. With the Casablancas arm two full box-length top clearers of adequate diameter are used and these are held at their end pivots by supports which are adjustable quite independently of the arm. Both the front and the back clearers can be set to work in any preferred position.



View of the drafting zone showing the new top arm and support bar

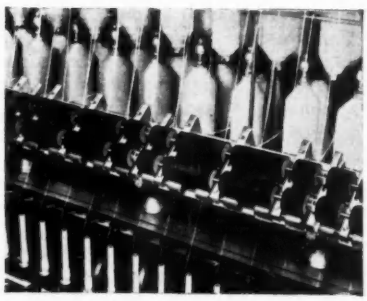
No Obstructions on Roller Beam

Whilst the arms are small and low they are, however, provided with the necessary springs for applying pressure on the top rollers and are locked unobtrusively at the back. No hooks or attachments, therefore, extend from the arm to the roller beam or to any other part of the machine. Since these arms are used in conjunction with a Casablancas system which, as is well-known, has a small lower band with no tensioning pulleys or rods of any kind, this means that ringframes equipped with the GX2 system have no obstructions on the roller beam, other than the stands themselves, and nothing between the roller beam and the bottom drafting rollers. This total absence of obstructions below and above the drafting rollers greatly emphasizes the practical advantages of the top arm method.

With the installation of top arm weighting in substantial quantities in mills, it has become necessary to have a mechanism of maximum simplicity and, in this respect the new arm is remarkable. It is made of one single piece of steel plate folded in the middle to form an inverted channel, inside which the roller holders, themselves inverted channels made of steel plate, are held by a set-screw. There being no swinging, sliding or otherwise moving parts within the arm, it is difficult even to imagine any possibility of the mechanism becoming damaged or failing to function properly.

Simple Manipulation

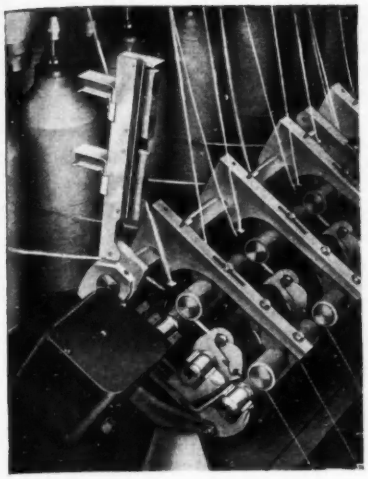
Simplicity of construction is not necessarily accompanied by ease of handling, but both are successfully combined in the Casablancas arm. The locking and arm lifting operations could not be more straightforward, whilst the top rollers can all be removed and replaced simply and quickly. The setting of the arm in the correct position is unique, in that it does not involve the clamping of the mechanism upon the back bar, nor does it require the usual fumbling and repeated attempts, by trial and error, until the unit has been clamped in a position that is correct for the arm. The Casablancas arm has a special screw, accessible through a small hole on the top of the arm, and by turning this one way or the other the working position of the arm is raised or lowered as desired. The adjusting screw always remains safely and automatically locked so that when the arm is in the correct position no further attention is required.



General view of the GX2 system showing the full box length top clearers

An item of which every user will have many thousands must be completely dependable and foolproof. The straightforward construction of the Casablancas arm is naturally a powerful factor in its dependability and foolproofness, but this is achieved to an extreme degree by reason of some significant features in the design of the arm. One feature is the type of springs used for providing the pressure to the top rollers. These springs are torsion springs of a size and shape most favourable for long, reliable operation. Their simple form ensures great uniformity between springs, which can easily be manufactured with a pressure variation of plus or minus 1·5%. Furthermore, the springs are used in pairs, one pair to each roller, with the result that the 1·5% variation is reduced to only 1·2%.

Another important feature is the method of holding the arms in working position. Whereas most weighting arms are held by clamping them on the round back bar and thus relying on a grip which is apt to lose its effectiveness in time due to stretching of the parts involved, the Casablancas arm is held positively against a solid stop and



View showing the main drafting parts, including the split cradle and platform

it will hold its set position indefinitely without any of its parts having to be strongly tightened against anything.

Complementary Improvements

The new principles on which the GX2 equipment is based have presented opportunities for introducing incidental developments of great practical value. Thus, in addition to the three lines of top rollers being of the latest ballbearing type, which need re-greasing only after thousands of hours work, the difficulties connected with the lubrication of the bottom rollers also have been solved, in the following manner. The top clearer brackets are carried on covers which fit over the bottom roller necks protecting them from fly and dust. Inside these covers are left pads mounted between parallel metal plates in such a way that each pad, oil impregnated, rests lightly upon the roller neck. This arrangement provides the right amount of lubrication over very long periods, and avoids the risk of the bottom roller necks ever being dry or over-flooded with oil.

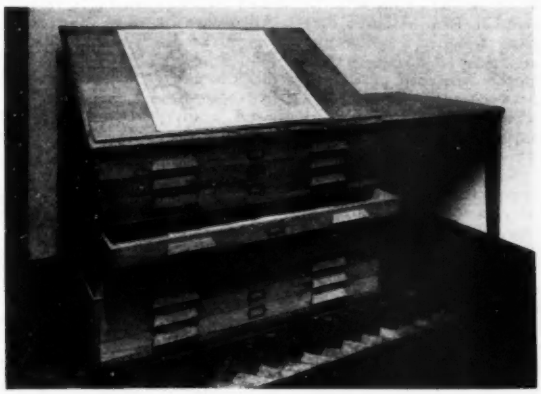
Drafting Efficiency and Scope

In the new Casablancas GX2 system the operative runs of the bands follow a curved path and are held resiliently together by the interlocking of the upper cradle, which carries and positions the top band, with a special platform mounted within the lower band. This platform engages the upper cradle by means of side flaps or projections which automatically determine the pressure between the two bands at the all-important delivery point. The makers state that fibre control obtained is so effective and adequate that almost certainly the GX2 system is without equal as regards the amount of draft it can perform or the quality of yarn it will produce. Moreover, by means of the very simple changes explained below, the GX2 system can deal with an exceptionally wide range of staple lengths and roving thicknesses without any alteration whatsoever to the roller settings.

Two alternative platforms are available, each being a 2-stage piece mountable in one of two positions to give a greater or lesser degree of control. The platform marked with the numbers "1" and "2" is suitable for all kinds of fibres up to a length of 1¾ ins. Platform marked "3" and "4" is used for extra-long fibres or for very exceptional bulk. To cope with longer fibres of up to 3 ins. or more the top middle rollers are simply fitted with "L" type bosses instead of the normal "S" bosses. The special "L" bosses, while positively driving the bands, do not impinge upon the central part of the intake nip of the bands and, consequently, allow the fibres to slip through them under a very light—but useful—amount of control, the draft then really taking place over one single zone from the back to the front rollers.

Combined Plan Chest-Viewing Table

A SIMPLE innovation to a conventional plan chest has produced a new product which should be useful in drawing offices and elsewhere. Introduced by Panda Office Equipment Co. Ltd., 18 Buckingham Palace Road, S.W.1, the company point out that by adding a movable top, the chest has become a viewing table. An angle support enables the top to be positioned at any required angle. This combined plan chest-viewing table was made originally to the specification of a London shipbroking firm and it will, of course, accommodate plans, drawings and other large documents.



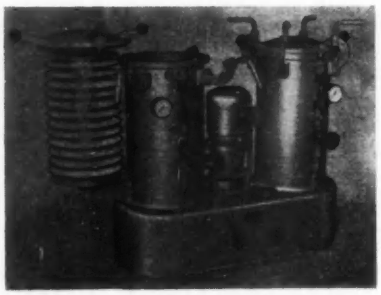
A combined plan chest-viewing table specially designed to accommodate plans, drawings, designs, or other large documents

Efficient Filtration of Industrial Oils

ALL oils used in textile mills and engineering shops, etc., are constantly subjected to contamination by metal abrasives, dust, oxidised oil and other impurities and, whilst it is recognised that the lubricating properties of such oils are not destroyed in use they are certainly rendered less effective by the presence of these impurities. Some of these particles are of microscopic size, and the presence of these necessitates frequent oil changes causing a sharp increase in costs. Continuous filtration of mineral oils, etc., to remove not only large-sized particles but also those of microscopic size, is essential both for efficiency and economy. Specially designed for continuous ultra-fine filtration down to 2 microns, the Schlegel Models F.1 and F.2 are compact units simple and safe to operate.

The F.1 has one filter chamber and the F.2 two filter chambers mounted on a base together with an electrically-driven oil pump. Each filter chamber is fitted with an inlet and outlet valve, flow indicator and pressure gauge which indicates when the filters require cleaning. A remote warning device can be supplied if required. The filter chambers contain easily removable two-way filter elements. The elements, the most important part of the unit, consist of special synthetic filter material which has a service life of several years.

Pivoted arms between the filter pads remove the accumulated residues on the filters, quickly and easily. The units are fitted with a device on which the filter element is placed for cleaning. One complete turn of the filter removes all residue completely. One advantage to which the makers draw attention is that the filter elements cannot, even after a long period, become clogged by accumulation of dirt. This is achieved by using a special ultra filter aid which is added to the filter chamber. This filter masse is floated on to the elements where it forms a sponge-like covering which absorbs impurities from the liquid.



Schlegel oil filter

When the filter pressure, after a long period, reaches a certain height, the filter is removed, cleaned, and a new charge of ultra filter masse is added. The regenerator is then ready for use again. The filtering capacity per hour of the F.1 is 66 gallons and the F.2 is 132 gallons.

The Airhydro Power Unit

AS a compact source of hydraulic power to operate presses, jacks and similar equipment, Charles S. Madan and Co. Ltd., Atlantic Street, Altrincham, have designed a new range of compressed air-operated pumps. This design, known as the Airhydro power unit, fills the gap between the standard Airhydropump, which is sometimes too large for many applications, and the junior airhydropu mp which has a limited output. There are nine models covering a hydraulic pressure range from 62 to 22,500 p.s.i. from a normal compressed air supply of not more than 100 p.s.i. The weights of the complete units vary from 50 to 80 lbs., and all models are 12 ins. high and overall diameters vary from 7½ to 12 ins., depending on ratio.

The pump works on the principle that the air pressure applied to a large air piston imparts a thrust to a hydraulic ram of smaller area and creates a high hydraulic pressure. The proportion of the air piston area to the hydraulic ram area is the ratio of the pump. Thus if air at 100 p.s.i. is supplied to a pump ratio 1 - 21·3 (as shown in the accompanying photograph) a maximum static pressure of 2,100 p.s.i. hydraulic can be produced. Should the pump be operating against an open circuit, as in the case of a moving ram, again with 100 p.s.i. air, it will, for example, deliver hydraulic fluid at a rate of 2½ pints/min. against a continuous pressure of 1,000 p.s.i. The air reducing and control valve supplied as part of the pump enables all intermediate pressures within the range of each model to be obtained. The makers point out that an important feature of this type of pump is its ability to maintain a static pressure indefinitely without consuming any air. If the balance is disturbed through a leak or a movement in the power-loaded machine, the pump will automatically move sufficiently to maintain the hydraulic pressure required.

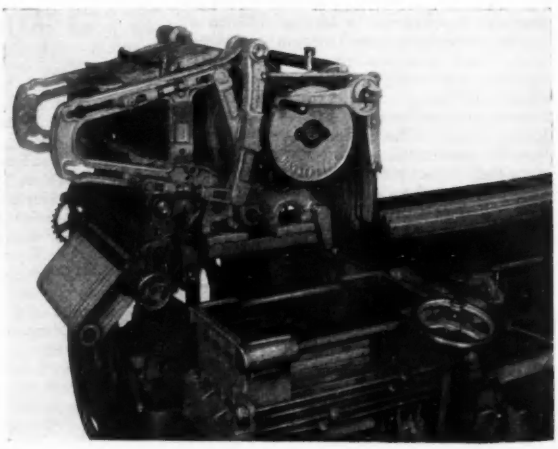
Airhydro power unit, Type JS

New Cam Dobby with Paper Card Mechanism

GEORGE Hattersley and Sons Ltd., Keighley, are now able to supply their Model 382 non-positive cam dobby equipped with the paper reading mechanism manufactured by Richardson Tuer and Co. Ltd., Farnworth, near Bolton. As will be observed from the illustration, close collaboration between the two companies has resulted in a very compact installation which—as the dobby and reading motion are both already well tried and proven mechanisms—promise to give every satisfaction in operation. A point to which the makers draw attention is, of course, the advantages of interchangeability of pattern cards—which are of metric pitch—with those used on some continental looms. Pitches of 10 or 12 mm. are used, with 16, 20, 25 and 28 shafts.

In the photograph, the entire dobby

The new dobby in position over the end of the Hattersley 4 · 1 box automatic shuttle changing loom



unit is mounted over the end of Hattersley's low-built silk, in this case their well-known 4 × 1 box automatic shuttle changer. A double cylinder mechanism is also available and is valuable for cross-border work but it is pointed out that as 100 picks utilise only 12 ins. of paper on the single cylinder machine, long repeats take up very little room. The feeler needles are very light on the paper and it is stated that any possibility of jamming and puncturing the paper is eliminated as the needles are placed in contact by gravity.

Industrial Remote Level Controller

THE new "Proxicon" Mark III dust and weatherproof industrial level controller announced by J. Edward Hall (Elec. Engineers) Ltd., Clarence Road Works, Leeds 10, is an addition to their existing range and replaces the Mark II. This new capacitance type industrial controller is designed to control the levels of any liquids or free-flowing solids without necessitating direct contact with the material. It has no moving parts in the container and a number of important advantages are claimed for it, including the following:—

(1) The addition of tapped electrode terminals, whereby remote control can be extended up to 3,000 feet using V.R.I., M.I.C.C., and other standard types of cable.

(2) The incorporation of heavy duty contactor type double-pole change-over relay with "Elkonite" faced contacts, giving greatly improved contact life and increased flexibility in control circuit functions.

(3) The provision of a "trigger" circuit by which "snap" operation is ensured even with a slow capacitance change, due to slow movement of material levels.

(4) The addition of a separate signal station unit, which incorporates the mains voltage signal lamps, has eliminated the overheating problem and gives the advantage of unrestricted siting for easy visibility.

(5) Improved circuitary and manufacturing techniques enable sensitivities greater than 1·0 pf to be achieved under all conditions subject to variations of not more than ± 0·25 pf with mains variations of + 5% to — 7½% and not more than ± 1 pf with temperature variation of ± 20°F. from a 68°F. datum figure.

(6) The inclusion of H.R.C. type cartridge fuses for relay circuits.

(7) The provision of an electrode switch for simple selection of High or Low level operations, with "fail to safe" feature in either condition of working.

This instrument can be supplied for single and dual level applications, voltage ranges 100/125, 200/250 and 360/450 volts, cycle range 40/60. Three voltage tappings are incorporated for each range to enable exact site voltage to be selected.

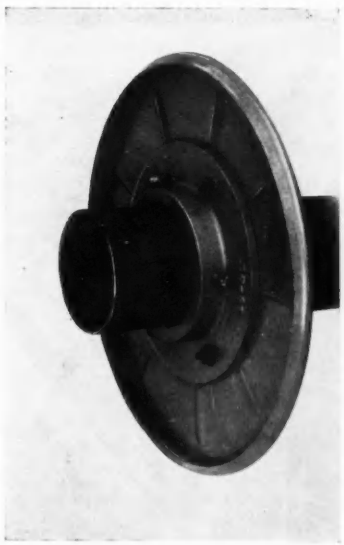
"Proxicon" industrial remote level controller for single level applications

Neat, Rapid, Locking Device for Beam Flanges

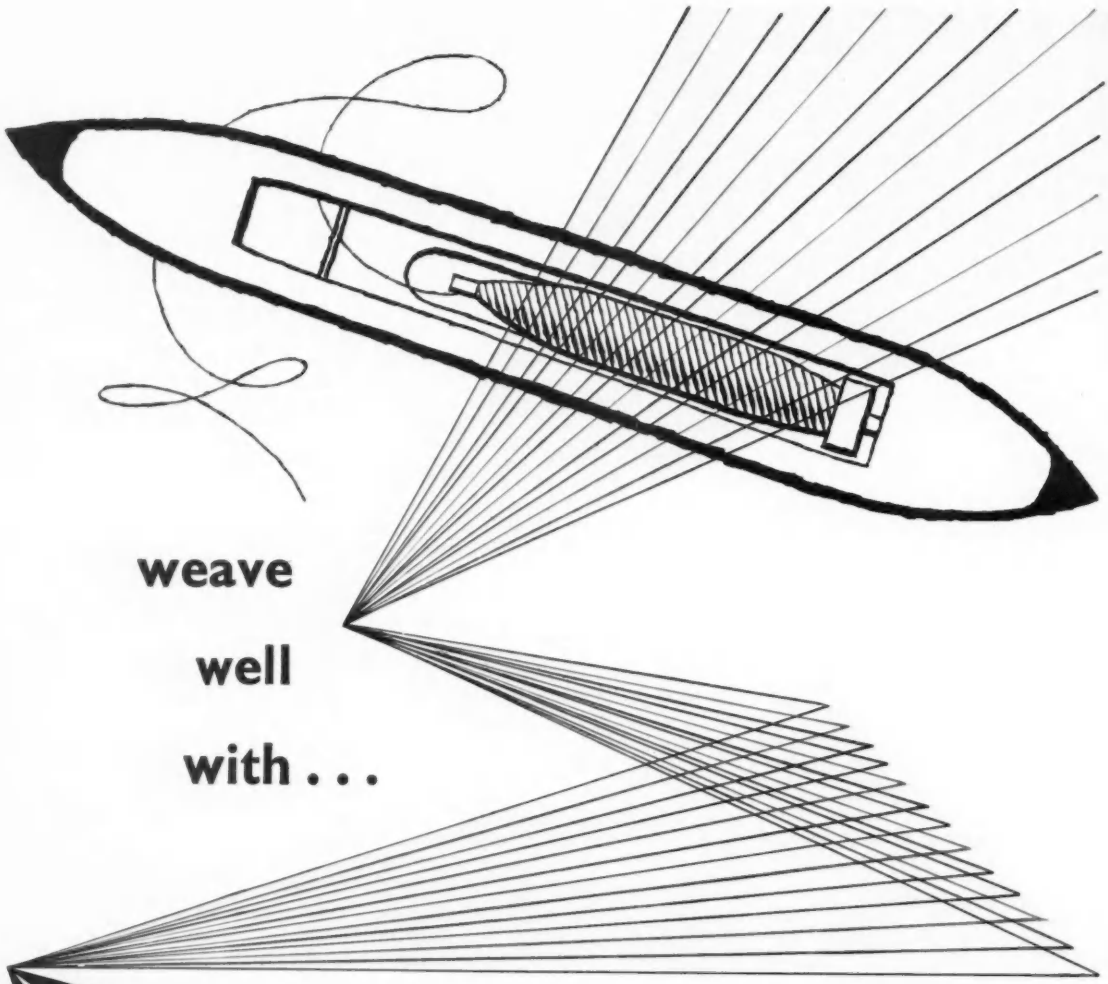
MODERN weaving methods accompanied by higher speeds and the ceaseless striving after improved standards of quality in yarns and cloth leave little room for slip-shod techniques at any stage of production. In no other aspect are these factors more important than in warping and weaving and, in both, the first essential is accuracy in the beam itself. Without this, it is virtually impossible to build-up a perfectly satisfactory full warp beam of even lay and density.

Designed by Mr. A. H. Spink of Bradford, who has had over 30 years' experience in the warping department of a worsted mill, an improved locking device for beam flanges eliminates faults in older methods which often necessitated the use of nails, wedges or packing, or excessive tightening that in many cases damaged the barrels—particularly wooden ones. A feature of the Spink Lockfast arrangement—now marketed by George Hattersley and Sons Ltd., Keighley—is the clamping device, housed in a bush secured to the flange. This comprises a radially contractable collar which grips the beam evenly when three set-screws are tightened, thus preventing longitudinal movement whilst the pressure—equally spread—does not damage the barrel.

The whole arrangement is neat, and adjustment to different warp widths rapidly carried out. The flanges are Hattersley's unbreakable mild steel type with radial corrugations and arch-shaped rim which has no sharp edges for the warp yarn to contact. Sizes are available to suit flanges in twelve different diameters from 9 to 24 ins., and beams in twenty-three diameters from 3 to 6⅞ ins.



The Spink beam flange locking device



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Recent Progress in Wool Research

Wool is not a uniform fibre. It varies throughout from the cuticle to the innermost cortex both in composition and structural elements and, because of this, any treatment applied will be effective more in one part than another

By B. C. M. DORSET

IN spite of recent developments in the synthetic fibre field whereby fibres can by various expedients and devices be utilised for the production of fabrics and garments having properties closely resembling those of wool, it has not yet proved possible to make artificially a type of fibre entirely capable of replacing wool. Yet the progress being made in this direction does make it necessary for wool producers to conduct intensive research so that the best use may be made of wool to allow the manufacture of articles having such high quality and usefulness that its competitive power against other fibres may be strengthened. It is important from this viewpoint to remember that there is always a double opportunity to modify artificial fibres so that they may the better compete with wool—the fibre properties may be controlled during fibre manufacture and the fabric and garment properties may be further improved by finishing treatments. By contrast any improvement in wool goods must largely come from finishing treatments—there is no rapid means for arranging that sheep produce better wool, although improvement may come from selective sheep breeding over the course of many years.

Quite a considerable amount of research on wool is carried out at the present time in various countries and much of this is sensibly promoted by the International Wool Secretariat using funds largely derived voluntarily from wool producers and users. Some very interesting and useful results are now coming to hand as the volume of this research steadily increases both in amount and quality and it is, of course, supplemented by independent research at the various universities and technical colleges.

Much of the present day research is assisted by the fundamental knowledge we now have about the nature and properties of wool fibres and which came from the pioneering investigations of such wool technologists as Speakman and Astbury—the former concerned mainly with the chemistry of wool and the latter with the fine structure of wool fibres. For many years it seemed that but little good could come from the application of resins to wool materials in spite of incentives provided by the great benefits obtained by the resin treatment of cellulose fibres such as those of cotton and viscose rayon. But recent research is beginning to show that it may yet prove of great benefit to apply resins to wool and so it may be useful here to draw attention to some discoveries which have been recently described.

In the first place it is necessary to notice that wool is not a uniform fibre such as cotton or viscose rayon—it varies throughout from the cuticle to the innermost cortex both in composition and in structural elements. Because of this any treatment applied to a wool fibre will be effective more in one part than another. Each wool fibre varies also in respect of its amorphous and crystalline contents and as is well known the crystallinity of a fibre largely determines its behaviour towards most reactants applied to it. Recent investigations have indicated (Burley, Nicholls and Speakman; J. Text. Inst., 1955, **46**, 427 *T*) that the greater part of wool is amorphous and that this proportion varies with the type of wool and the growth conditions on the sheep's back. As an example of this the data in Table 1 may be quoted as showing how in different types of wool the ratio of crystalline to amorphous keratin may vary:

Table 1

Type of Wool	Crystalline/Amorphous Ratio
Lincoln	**0·145**
Romney	**0·188**
Merino	**0·196**
Mohair	**0·214**

In general the amorphous part of a wool fibre is that most accessible to applied reactants and it would appear to be 80 to 90% of the average fibre. Another fact established by the workers mentioned above is that the proportion of crystalline and amorphous keratin present in any type of wool fibre will vary according to the shape of the fibre tips of which some are straight and others curly (see Fig. 1). The data in Table 2 illustrates this point.

The suggestion has been made that the plasticity of wool (one of its most important properties to the textile

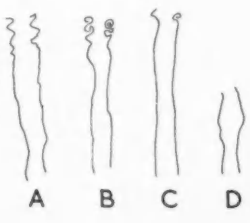


Fig. 1. Types of wool fibre: A. Sickles B. Early curly tips C. Late curly tips D. Histerotrichs

Table 2

Type of Fibre	Crystalline/ Amorphous Ratio
Sickles (thin tapering curly tip)	0·205
Early curly tips (several curls but not tapered ..	0·153
Late curly tips (as early curly tips but fewer curls)	0·161
Histerotrichs (straight tips)	0·134

finisher who has to give wool garments a smooth silky surface and fix their shape by hot pressing operations) is closely linked to the sulphur content of wool and also its content of amorphous keratin. The data in Table 3 taken in conjunction with those given above could support this relationship but it would be necessary to examine a wide range of different wools to draw any firm conclusion.

Table 3

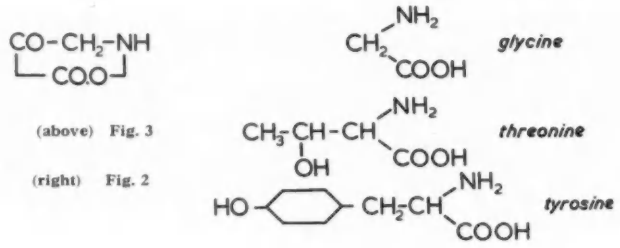
Type of Fibre	Sulphur Content	Plasticity Increase
Sickles	3·86%	
Early curly tips	3·34%	
Late curly tips	3·41%	
Histerotrichs	3·02	

There is another aspect of the non-uniform structure and composition of a wool fibre which is interesting—it concerns the distribution of the amino-acid constituents. Present day ideas about the structure of keratin indicate that this wool-substance is made up of long keratin chain molecules to which are attached many side chains which may also be combined at their extremities, thus crosslinking the chain molecules and giving the keratin a more rigid structure. These side chains are amino-acid residues and they are very varied. Recent research has shown that the following amino-acid residues can be identified as being present in the proportions shown in Table 4.

Table 4

Amino-acid	Amount Present in m.moles/gram of Wool
Glycine ..	0·866
Alanine ..	0·494
Valine ..	0·487
Leucine ..	0·961
Serine ..	0·904
Threonine ..	0·563
Aspartic acid	0·549
Glutamic acid	1·088
Lysine ..	0·233
Hydroxylsine	0·011
Arginine ..	0·609
Histidine ..	0·071
Cystine ..	0·546
Methionine ..	0·047
Phenylalanine	0·242
Tyrosine ..	0·337
Tryptophane	0·088

Some of these amino acids have large or long while others have relatively small or short molecules so that their distribution within a wool fibre could have a material effect on the fibre properties. For example, the molecules of glycine, threonine, and tyrosine have the formulae shown in Fig. 2.



(above) Fig. 3

(right) Fig. 2

Amino-Acid Distribution

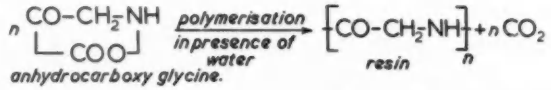
Now an important point about the distribution of these amino-acid residues is that there is considerable evidence to show that within the crystalline regions of the wool fibre there is a preponderance of short side chains attached to the keratin chain molecules whilst in the amorphous regions it is the long side chains that are most in evidence. This implies that the more complex amino-acids are to be found in the amorphous regions, while the simpler amino-acids are mainly to be found in the crystalline regions. This difference in amino-acid distribution must influence the reactivities of the two regions.

From a consideration of all the above facts it becomes evident that each wool fibre consists (quite apart from any consideration of epithelial scales, cuticle membranes, cortical cells, etc.) of a large proportion of amorphous keratin in which there is a preponderance of large bulky amino-acid residues and a much smaller proportion of crystalline keratin where the amino-acid residues are mainly of the small molecular kind. By contrast it may be recalled that cotton fibres consist of cellulose molecules which have no attached side chains and are thus not crosslinked and that the fibre structure is mainly crystalline. Thus, in general, cotton is a more inert fibre than is wool.

It has been mentioned above that hitherto the resin-finishing of wool goods has not produced such good results as in the case of cotton and viscose rayon materials. Yet the fact that wool contains such a large proportion of amorphous keratin readily accessible to reactants would suggest that it should be possible to apply resins usefully. In the case of cotton the application of resins satisfactorily has to some extent been hindered by the highly crystalline nature of cotton fibres for here, as with wool, reactants find the amorphous regions easier to penetrate.

In applying resins to wool there is the possibility of forming them within or externally to the wool fibres and the further possibility of forming these resins so as to exist merely as uncombined resin deposits within the fibres or chemically combined to the keratin chain molecules. Whatever method is adopted it seems possible to modify considerably the properties of the wool fibres. In some early investigations Baldwin, Barr and Speakman (J. Soc. Dyers and Col., 1946, **62,** 4) showed that the highly reactive and self-polymerising monomeric anhydrocarboxyglycine having the formula given in Fig. 3 and obtainable in crystalline form by the method of Leuch (Ber., 1906, **39,** 857) from the ethyl ester of glycine could be applied to wool under suitable conditions so that there was built up over the surface of each fibre a thin layer of polymerised anhydrocarboxyglycine. By treating wool at 50°C. for six hours with 5% (calc. on the wool) of anhydrocarboxyglycine dissolved in ethyl acetate containing 2% of water and with a liquor/wool ratio of 33/1 this film could give a weight increase on the wool of 4% and at the same time so affect the wool that it almost completely resisted shrinkage during prolonged washing. Methods of attempted extraction showed that the polymerised anhydrocarboxyglycine film formed as shown in Fig. 4 was not a simple external deposit but was chemically combined to the fibre surface. Not only does such a polymer film make wool unshrinkable but it protects the wool against abrasive

Fig. 4



forces to the extent that the wear value of the treated wool can be up to three times its normal value. Unfortunately anhydrocarboxyglycine is not commercially available to enable it to be used for the treatment of wool goods on the large scale but these investigations did show that a resin could be formed chemically combined to the wool fibre substance (keratin).

More recently Lipson and Speakman (J. Soc. Dyers and Col. 1949, **65,** 390) have discovered a very useful technique for forming a wide range of resins within wool fibres and have thereby been able to improve wool materials as regards their wear value and resistance to shrinkage during washing. The method involves drying into the wool fibres a small amount of a ferrous ammonium sulphate solution and then treating with an aqueous solution of methacrylic acid containing a trace of hydrogen peroxide so that this latter agent with the iron present gives hydroxyl radicals capable of catalytically causing polymerisation of the methacrylic acid to give an insoluble resin fairly uniformly distributed throughout the interior of the wool fibre. Instead of methacrylic acid it is possible to use other similar polymerisable substances and if these should be water-insoluble, for example, the methyl ester of methacrylic acid, then they should be first emulsified with an aqueous solution of Lissolamine V (I.C.I. Ltd.). Quite large amounts of resin can thus be formed within wool fibres, say up to 50% and even higher. The formation of resin in the case of methacrylic acid is favoured by excluding air or other oxidising atmosphere and in an atmosphere of nitrogen the catalytic effect of the iron is so much increased that 20% of resin can be formed within the wool during 10 mins. which same amount would otherwise require a reaction period many times greater.

In a typical resin treatment wool is first impregnated with a 0·1% solution of ferrous ammonium sulphate at 25°C. and is then dried so as to give an iron content of 0·03% to the wool. This wool is then treated for three hours at 50°C. with a liquor containing 5 c.c. of methacrylic acid, 10 c.c. of N. sulphuric acid, and 0·0006 grams of hydrogen peroxide per 100 c.c. Following thorough washing and drying the wool may then be expected to have an added weight of about 20 to 40% according to the liquor/wool ratio employed.

In a treatment with a water-insoluble monomer such as methyl methacrylate the wool material will have an iron catalyst deposited within it as described above and then be treated for say two hours at 35°C. with a liquor which is an aqueous emulsion containing say 5 c.c. of methyl methacrylate, 0·02 grams of Lissolamine V, 10 c.c. of N. sulphuric acid, and 0·0006 grams of hydrogen peroxide per 100 c.c. The added weight due to the resin formed within the fibres may amount to more than 40%. In all such investigations with methacrylic acid and methyl methacrylate it was found advantageous to apply these resin-forming substances in an acid liquor.

As a variation of the above methods it is possible to apply mixtures of methacrylic acid and methyl methacrylate in aqueous emulsion and thus produce within the wool fibres copolymers and perhaps mixtures of the separate polymers of these substances —the emulsion technique allows both water-soluble and water-insoluble polymerisable monomers to be applied simultaneously. The alternative procedure is possible (although not generally acceptable for large scale use) of applying the polymerisable monomer from its solution in an organic solvent —resin formation can take place just as satisfactorily as when aqueous solutions or emulsions of these monomers are employed.

Two-Stage Treatment

The above method of forming resins in wool from methacrylic acid and methyl methacrylate require a two-stage treatment—the deposition of the iron catalyst in the wool and the subsequent treatment with a liquor containing the monomers polymerisable. It would be better if this resin treatment could be modified so as to be carried out in one stage. This improvement has quite recently been found possible by Madaras and Speakman (J. Soc. Dyers and Col. 1954, **70,** 112) by the simple expedient of using potassium persulphate instead of hydrogen peroxide. Under such conditions the free radicals which are required to catalyse the polymerisation process are formed by the action of the persulphate on the cystine disulphide bonds which are normally present in wool to crosslink the keratin chain molecules.

We can now turn to current work being done in the application of resins to wool and as discussed by Ghosh, Holker and Speakman (J. Textile Research, 1958, **28,** 112). Various workers have noticed the relative inefficiency of formaldehyde to react with wool and effect a crosslinking of the keratin chain molecules—this reagent is much more effective with cotton and other cellulose fibres. The explanation appears possible from two viewpoints. Firstly, the formaldehyde molecule is very short and thus it may be unable to bridge the comparatively

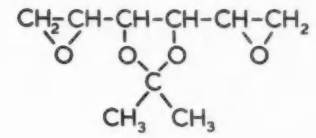
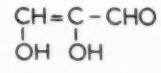


Fig. 5

large distances between the keratin chain molecules in the amorphous regions of the wool fibre and secondly because there is such a large proportion of amorphous keratin in wool fibres. But against this it must be stated that attempts to crosslink keratin chain molecules with di-epoxides such as 3 : 4-iso-propylidene 1:2-5 : 6-dianhydromannitol having the formula appearing in Fig. 5 and thus consisting of long molecules have proved largely ineffective.

In spite of the above it would appear that there must be some polymerisable monomers which might be induced to unite to the keratin chain molecules with one end of their molecule and then be further induced

Fig. 6



to polymerise at the other end so that the result is the attachment of one end of a polymer or resin to the keratin molecule with the other end free or possibly united to another keratin molecule (in this latter case crosslinking would be effected). Ghosh, Holker and Speakman have now disclosed that they have attempted to achieve this by the use of a comparatively newly available agent known as reductone which has the formula given in Fig. 6.

This substance readily polymerises to give a polymer of the type shown in Fig. 7 and it is also capable of reacting with amino groups such as are present in the amino-acids side chains of the keratin molecule as present in wool fibres. It could therefore be anticipated that by treating wool with reductone adjacent keratin molecules might become crosslinked with the

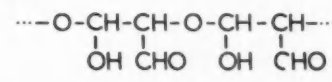
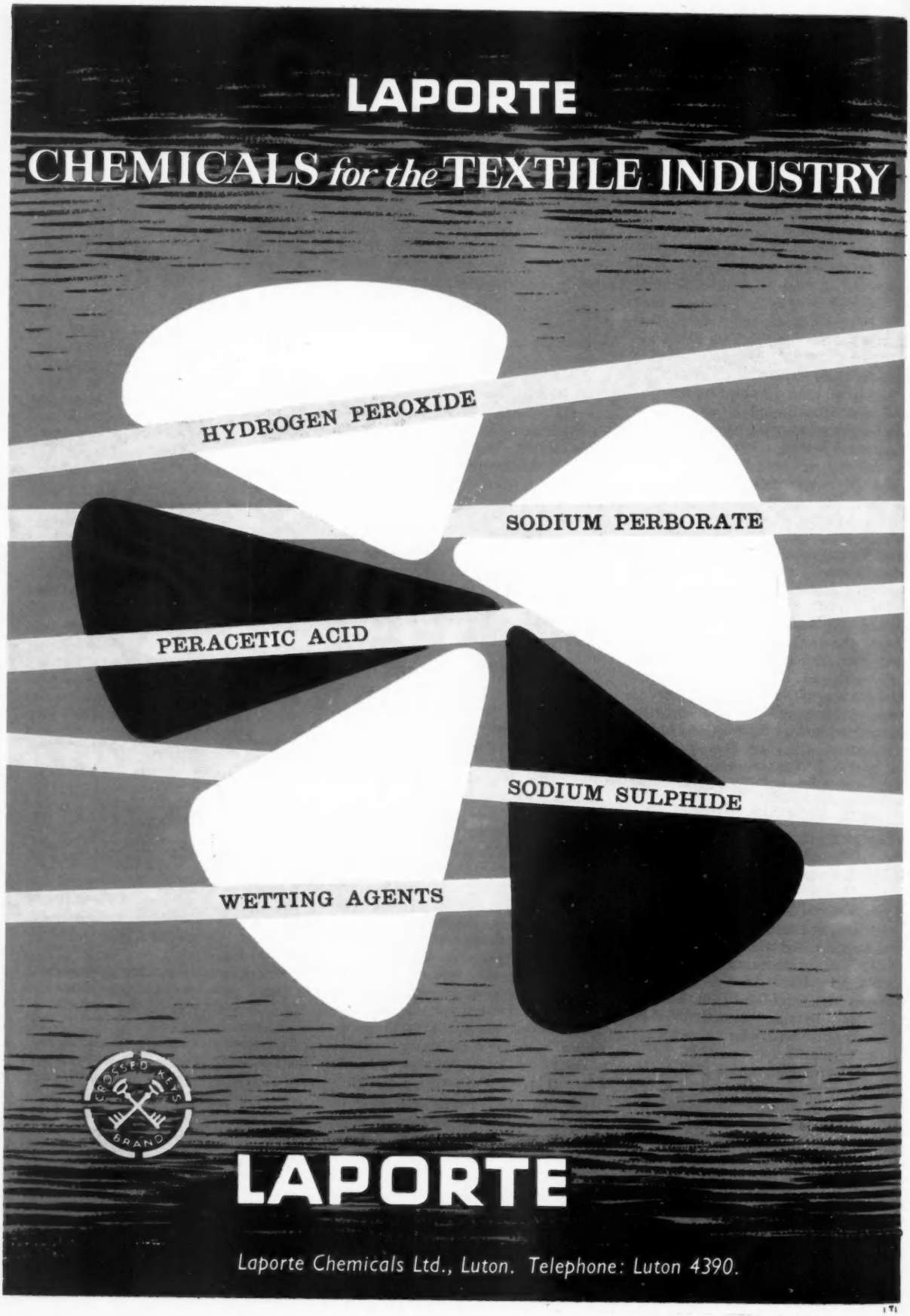


Fig. 7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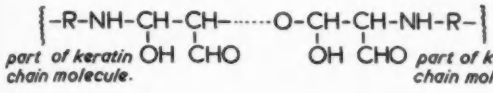


Fig. 8

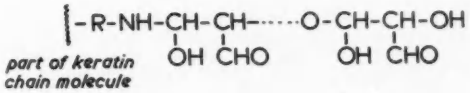


Fig. 9

polymeric group indicated as shown in Fig. 8, or the polymeric groups might be attached each as a side group to any keratin molecules as in Fig. 9.

The facts established by experiment are that when reductone is applied to wool at temperatures around 50°C. the wool certainly combines with it so as to give a much increased weight, and at the same time the wool fibres are given permanent resistance to the wet extension which may be produced by stretching. It is likely that the reductone has chemically combined (with or without—a crosslinking of the keratin molecules) with the fibres. It thus appears that this particular agent can be the means of improving the properties of wool.

If the keratin of wool be regarded as a polymer then the combination of this with a polymeric group such as may be derived from reductone or methacrylic acid or methyl methacrylate or anhydrocarboxyglycine can be looked upon as a process of forming a graft co-polymer with the wool. From this viewpoint there seems to be almost endless possibilities in forming such graft copolymers and at least some of them should result in wool improvement.

Ghosh, Holker and Speakman have indicated a very novel approach to producing graft polymers with wool following a discovery by Marten and Speakman (Chem. & Ind., 1957, p. 955) that when unsaturated maleic anhydride having the formula given in Fig.10 is dried into wool it forms a combination with the wool presumably of the type given in Fig. 11 and gives the wool protection against damage during heating under high temperature conditions which would otherwise be harmful and lead to yellowing and increased solubility in alkalis. Maleic anhydride does not of itself readily self polymerise but in the presence of a vinyl compound such as styrene it does copolymerise with this. So, if the wool pre-treated with maleic anhydride as indicated above is then further treated under appropriate conditions, including the presence of a catalyst, with say methyl methacrylate then there is formed within the wool a special type of graft copolymer shown by the formula in Fig. 12.

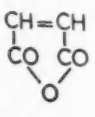


Fig. 10

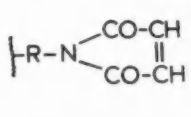


Fig. 11

It is not necessary here to deal further with this application of resin substances to wool except to emphasise that by such treatment there is excellent scope for modifying beneficially the strength, wear resistance, and general durability of wool materials; it is also possible to modify the dyeing properties in the same way and if acid resins are applied the dye absorptive powers can be reduced while if basic resins are used the resulting wool is likely to have increased dyeing power.

Wool Carbonisation

The carbonisation process is a very useful and convenient one for removing cellulosic impurities from raw wool. Essentially it consists of impregnating the wool with a dilute solution of sulphuric acid and following this by drying and baking at about 100°C. (all this processing is effected continuously in a suitable plant) to convert the cellulose plant fragments, fibres, etc. to a friable state so that when the carbonised wool is then passed through a willeying machine such impurities can be beaten out in the form of dust. The baking of the wool itself with acid can modify its properties but the conditions employed in which sulphuric acid of about 4–6% is used for impregnation are such as to cause no appreciable harm to the wool. However, it is possible for the wool strength to be lowered somewhat and its dyeing properties changed according to the dyes ultimately applied; with a lowering of strength the wool fibres may also be embrittled so as to have a decreased extensibility and wear value. Some two or three years ago it was shown that any such adverse effect of the hot acid on the wool could be mitigated to some degree by the addition of an ionic or non-ionic surface active agent to the acid impregnating liquor. This aspect of wool carbonising has now been again examined with particular reference to large scale working conditions.

Crewther and Pressley (J. Text. Research, 1958, **28,** 67) have given interesting data obtained from laboratory investigations which show the effect of adding a surface active agent to the carbonising liquor (two to three times the usual strength) and which indicate something which might be expected in large scale working. In these investigations the wool was treated with a solution of sulphuric acid so that after the usual centrifuging and immediately before the baking at 100°C. for 60 mins. it contained (calc. on the weight of dry wool) about 11% of sulphuric acid. The data obtained are given in Table 5.

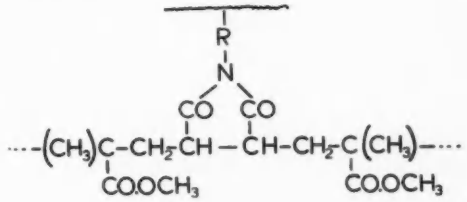
Obviously the protection given to the wool during carbonising by the inclusion of a surface active agent in the acid liquor can be well worthwhile and since a non-ionic agent is less

Table 5

Surface Active Agent	Sulphuric Acid Content of Wool before Carbonising	Reduction (in Carbonised Wool) of Tensile Strength	Extensibility
None	9·0%	20%	36%
Lissapol NX (non-ionic)	12·0%	2%	2%
Sodium salt of lauryl sulphate (anionic)	11·9%	4%	11%
Teepol 610 (anionic)	11·9%	1%	4%
Cetyl trimethylammonium bromide (cationic)	11·8%	5%	10%

Note: Lissapol NX is stated to be 4-(w-hydroxy-octa-ethyleneoxy)-n-octyl benzene and it has the useful characteristic of not being preferentially absorbed by the wool during treatment.

Fig. 12 (right)



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likely to be reactive towards and possibly be precipitated by other substances present in the acid liquor it is most fortunate that this type of agent should be highly effective.

Encouraged by the useful results tabulated above, Crewther and Pressley conducted large scale mill trials in which the non-ionic surface active Lissapol NX was used in the acid carbonising liquor initially at 0·5% but additions were periodically made thereafter at the rate of 0·05 lbs. per 100 lbs. of wool. In each trial a batch taken from the same wool was similarly processed but without the use of the Lissapol NX. Following carbonising the wools were spun into yarn so that the yields and strengths of these yarns could be determined. The results are shown tabulated in Table 6.

Table 6

Mill Trial	Yield	Yarn Strength
Mill A		
Without Lissapol NX	57·0	547
With „ „	58·9	602
Mill B		
Without Lissapol NX	45·0	335
With „ „	45·3	386
Mill C		
Without Lissapol NX	55·5	689
With „ „	58·9	841
Mill D		
Without Lissapol NX	66·4	778
With „ „	79·3	989

In the case of Mill D a further comparative trial involved the use of the anionic surface active agent, sulphonated castor oil, but it was observed that this was very rapidly absorbed from the liquor by the wool so as to be regarded as unsatisfactory from this viewpoint. Comparison of costs indicates that the increased yield of wool which is obtained when a surface active agent is added to the sulphuric acid carbonising liquor far outweighs the additional cost of the surface active agent added.

Some interesting data were also obtained by determining the alkali-solubility of the wools during their processing since this property is a measure of the degradation of the wool. Some of the data appear in Table 7.

In considering the above data it should be noticed that there is a significant degree of damage produced during the acid impregnation—possibly this is connected with the tendency for the acid bath to become warmer as the wool is treated in it. Since the willeying treatment to separate the disintegrated cellulosic impurities from the baked wool is moderately severe as regards its action on weak wool fibres it would appear that in part at least the greater yield of wool obtained by use of the Lissapol NX can be explained by the fact that the wool fibres entering the willeying machine are stronger when Lissapol NX is used. However it must be remembered that since the wool is finally neutralised with alkali there is opportunity for some of the wool to dissolve if it has been badly degraded —certainly the wool will lose less in this neutralisation if it has been carbonised with the presence of Lissapol NX since it is thereby protected from excessive degradation.

The influence of a surface active agent in the acid carbonising liquor can be more complex than at first contemplated and have results not suspected. Thus it would be expected that the Lissapol NX or other agent would facilitate rapid entry of the liquor into the wool but there is also the unexpected fact that with such use of a surface active agent the wool is left not only with a higher acid content but with a lower water content. The data in Table 8 illustrate this point.

Some laboratory investigations on this point have shown that when the wool is entered into a sulphuric acid solution water initially passes from the wool into the bulk of the solution until the water content of the wool reaches a minimum amount and that the presence of a surface active agent hastens this initial removal of water from the wool up to the point of attaining the minimum water content. Equilibrium point is reached only after about one-half hour. It is obvious that this point is not reached in the carbonisation of wool on the large scale for the wool seldom has an acid treatment of more than 1 to 5 mins. However, by the use of a surface active agent this point of equilibrium can be more closely approached. The importance of this is that the less water left in the wool immediately prior to the drying and baking operations the less can be the fuel costs of drying. The suggestion has been made that from this viewpoint it might be profitable to extend the duration of acid impregnation to secure this extra absorption of acid and lower retention of water by the wool.

Examination of the acid bath contents has shown that on the large scale working there is a tendency for sodium sulphate to accumulate in the sulphuric acid liquor. What effect might this salt have on the wool during the subsequent drying and baking? Some investigations have shown that it can be beneficial and actually serve to protect the wool from degradation. It would appear that a maximum of from 2 to 3% of sodium sulphate can accumulate in the acid bath in this way in large scale operations.

In some experiments wool was carbonised using acid baths to which increasing amounts of sodium sulphate had been added and the effect of this on the strength of the wool was then determined with the results shown in Table 9. Apparently the presence of the sodium sulphate does not much influence the acid pick-up but it does ensure that the wool suffers the minimum of damage, and in particular the strength of the wool resulting from carbonising with an acid containing as much as 10% of sodium sulphate is considerably higher than when this addition is omitted.

Table 8

Conditions of Carbonising	Contents of Wool Leaving the Squeeze Rollers attached to the Acid Bath	
	Sulphuric acid	Water
A Without surface active agent ..	6·6%	33·3%
With „ „ „ ..	7·9%	29·3%
B Without „ „ „ ..	7·2%	35·4%
With „ „ „ ..	8·0%	30·4%

Table 9

Sodium Sulphate in Acid Bath	Sulphuric Acid found in Impregnated Wool	Strength Rating of Carbonised Wool
0·0%	10·5%	1
0·5%	10·4%	1
1·0%	10·5%	1
2·0%	10·4%	2
5·0%	10·2%	2
10·0%	10·0%	4

Table 7

Addition to Carbonising Liquor	Preliminary Scour 1	% Alkali-Solubility of Wool after: Acid Impregnation	Drying	Baking	Final
None	12·0%	13·9%	13·2%	13·1%	12·5%
Lissapol NX ..	11·9%	12·7%	12·3%	12·2%	12·9%
None	13·6%	15·2%	14·5%	14·9%	13·7%
Lissapol NX ..	13·0%	13·7%	14·3%	14·2%	13·3%

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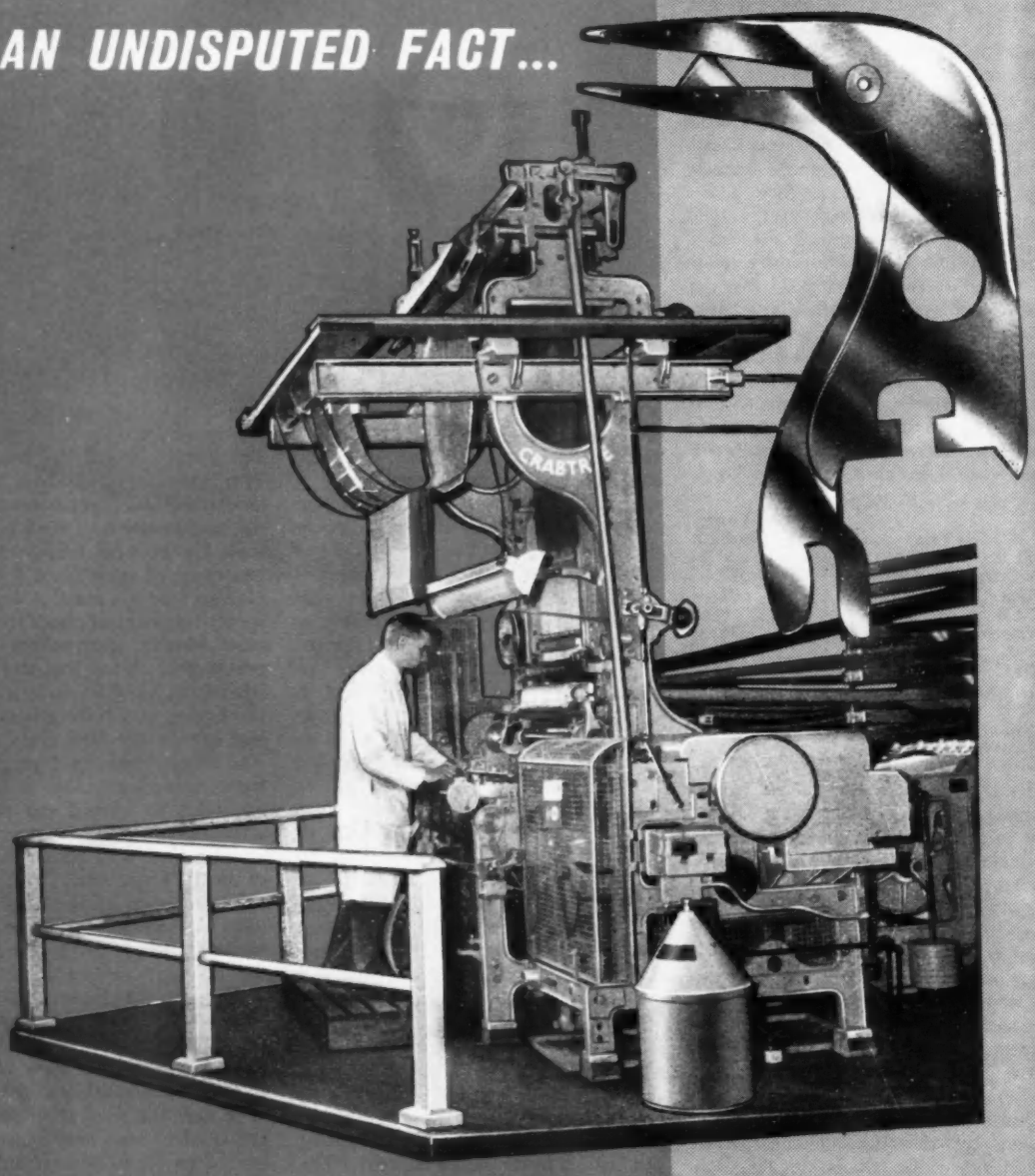

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Blends of "Acrilan" with viscose in the proportion 70/30% are now appearing in reasonable quantities and a variety of effects can be produced by reserving one or other of the fibres, or dyeing two-tone and solid shades

By H. KELLETT†

As with all synthetic fibres, the dispersed dyestuffs are of major importance in dyeing "Acrilan" and "Orlon." It is important to get rid of the idea that the dispersed colours are colours having poor wet fastness properties. This may be true on secondary acetate rayon, but when dyed on "Acrilan" and "Orlon", the dispersed dyes in general give shades of excellent fastness to washing, water and perspiration. To obtain the best light fastness and build-up from dispersed colours it is necessary to select carefully from the available ranges, but it is possible to obtain a light fastness of 5 in most cases.

One difference between "Acrilan" and "Orlon" lies in the build-up obtainable on the two fibres with dispersed dyes. While "Acrilan" can be dyed at the boil in a full range of shades, "Orlon" under the same conditions will only give pale to medium shades. The method of dyeing is the same with both, the process being commenced at approximately 60°C. in the presence of 1 gram/litre of an anionic dispersing agent such as Eriopon CW. The temperature is raised to the boil and maintained at this for 1½ to 2 hours, depending on depth of shade required. It is important when dyeing these fibres to get as good a boil as possible and enclosed machines are preferred. Where medium and heavy shades are dyed on "Acrilan" with dispersed dyes it is preferable, after slowly cooling the dyebath, to give a light scour with 1 gram/litre of a non-ionic detergent such as Tinovetin CW at about 60°C. to ensure optimum rubbing and wet fastness properties. Dispersed dyed acrylic fibres generally have a softer handle than the same fibres dyed by other methods.

Suitable colours for both fibres are:—Setacyl Blue 4GS Supra; Setacyl Blue 2GS; Setacyl Yellow G; Setacyl Yellow BS 200; Setacyl Orange RE; Setacyl Orange 4R; Setacyl Pink 3B. On "Orlon" the Blue 2GS is preferred as the blue component, while on "Acrilan", Setacyl Blue 6GN and Setacyl Red 2B are of use in certain cases for pale shade.

The acrylic fibres are often subjected to permanent pleating or some form of heat treatment after dyeing, and in these cases it is necessary to ensure that the dyestuffs used are unaffected. On both "Acrilan" and "Orlon" it is possible to select suitable combinations of dispersed dyes for pale shades. Examples are:—"Acrilan"—Setacyl Blue 6GN; Setacyl Yellow BS 200; Setacyl Red 2B. "Orlon"—Setacyl Blue 2GS; Setacyl Yellow BS 200; Setacyl Red 2B.

When medium to heavy shades are required on "Acrilan," fast to pleating, trouble is often experienced in finding a suitable red component which will give satisfactory build-up in heavy shades. This problem can be solved by taking advantage of the fact that one of the members of the recently introduced Maxilon range of modified basic colours (Maxilon Red BL) is capable of dyeing "Acrilan" under the same conditions as the dispersed colours. Maxilon Red possesses excellent fastness to wet treatments and pleating on "Acrilan" and gives a light fastness of 5–6 in medium depths. In addition this colour on "Acrilan" is tinctorially 4 or 5 stronger than most normal strength dispersed colours and offers excellent value in heavy shades.

While the shade of Maxilon Red BL is rather on the blue side, it is possible in combination with selected dispersed yellows to produce scarlets of exceptional brightness. Thus, it is possible to produce a wide range of deep shades on "Acrilan" which are fast to pleating by using a combination of Maxilon Red BL with a selected dispersed blue and yellow such as Setacyl Blue 4GS Supra and Setacyl Yellow BS 200%. For the brighter scarlet shades, Setacyl Yellow G is preferred as the yellow component along with the Maxilon Red BL.

To obtain the best results from this combination of colours, certain precautions should be taken.

(1) Maxilon Red BL should be dissolved separately by pasting with warm water and then pouring on to it boiling water with stirring. This colour should not be boiled under an open steam pipe.

(2) The red should be added to the full volume of dye liquor set with 1 gram/litre Eriopon CW and the well dispersed Setacyl dyestuffs at 60°C. If Maxilon Red and the dispersed colours are mixed in a small volume of liquor, tar spotting may occur.

(3) The pH of the dyebath should be approximately neutral. Under acid conditions Maxilon Red BL has poor affinity for "Acrilan", while under strongly alkaline conditions the yield is very much reduced.

In the remarks regarding dispersed colours on "Acrilan" it was mentioned that shades up to a black can be obtained. As an example, Setacyl Black EBR dyed at the boil for about 3 hours gives a good black of light fastness 6, but having only poor pleating fastness. Where a black shade on "Acrilan" is required to be fast to pleating it is necessary to use a diazotised and developed Black such as Setacyl Diazo Black GND coupled with Irganaphthol RTO. The two components are applied to the fibre from the same bath and finally diazotised and coupled using hydrochloric acid (or formic) and sodium nitrite at 85°C. Because of the strongly acid nature of the diazotising bath, neutralisation of the goods with soda ash and a non-ionic detergent is preferably carried out after dyeing to maintain the soft handle of the fibre. The black produced has a light fastness of 6 and shows excellent fastness to pleating.

Basic Dyes

Both "Orlon" and "Acrilan" can be dyed with these colours, but in general they are more important on the former, because a much wider range of shades can be obtained on "Acrilan" by other means. On "Acrilan" the old type basic colours may be dyed from a bath containing 5% ammonium sulphate and 1% Irgasol PMC. Dyeing is commenced at 50–60°C. and the bath raised to the boil, at which temperature dyeing is complete in approximately 90 mins. The colours appear to exhaust quite gradually on this fibre, and there is no rapid strike over any particular temperature range. On "Orlon" dyeing is carried out by a similar method, from a bath containing 2% acetic acid 40% and 2% sodium acetate. In this case particular care must be taken in raising the temperature as rapid uptake of the basic dyes occurs between 85°C. and the boil. Over this range the rate of temperature rise should be as slow as possible.

Maxilon Dyes

The improved fastness of the basic dyes on acrylic fibre has led to extensive research into the manufacture of modified basic

* *Abstract of a paper given recently to the Guild of Calico Printers in Rochdale.*

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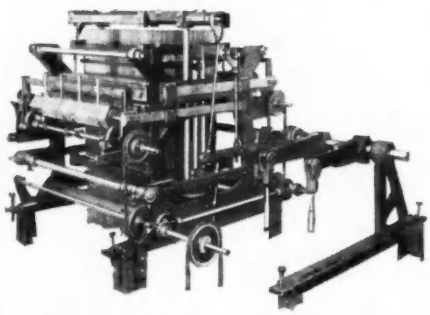

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colours and among the various ranges available are the Maxilon colours. The method of application is novel and does not correspond to that recommended for any other range of modified basic dyes. The Maxilon range comprises four colours:—Maxilon Red BL; Maxilon Blue RL; Maxilon Blue GL; Maxilon Yellow 3GL.

On "Acrilan," the application is quickly dealt with. Unfortunately, there is no satisfactory method of dyeing the four colours in combination, as all require a different pH to obtain optimum colour yield. Thus, under acid conditions, the blues give good results but the red will not exhaust. Under conditions suitable for the red (neutral or slightly alkaline) there is danger that the blues may be destroyed in the dyebath. This disadvantage becomes less important when one remembers that on "Acrilan," the modified basic colours generally are duller in shade and have lower light fastness than on "Orlon." In most cases, therefore, the modified basic colours offer little advantage on shade grounds over the dispersed/Maxilon Red BL combinations.

On "Orlon," the position is much different. The range of shades obtainable with dispersed dyes is limited and the heavier shades must be dyed with basic colours. Fortunately, practically any desired shade except a full black can be obtained with Maxilon dyes.

The four Maxilons can be dyed by the acetic acid-sodium acetate method recommended for normal basic dyes, but as on "Acrilan," all dye at different rates thus making shade matching difficult. For this reason the new "IT" method was introduced. This requires the following additions to the dyebath:—1·0–2 grams/litre Irgasol PMC; 0·5–1 gram/litre Irgasol DA; 2% acetic acid 40% (used for dissolving the colours).

Irgasol DA has been found to exhibit a remarkable retarding effect on the Maxilon dyes and obviates any differences in dyeing rate of the individual colours. The addition of an anionic product of this type to a dyebath containing cationic dyestuffs would be expected to give precipitation. Irgasol DA in fact shows little tendency to do this, but in order to avoid such undesirable effects, an anti-precipitant, Irgasol PMC, is added to the bath. The optimum pH conditions are between 4 and 5 and this value is conveniently obtained by the addition of acetic acid to the bath. The larger quantities of Irgasol DA and PMC are recommended for heavy shades in short liquor ratios and for yarn dyeing.

Prior to commencement of dyeing, any cationic products such as anti-static agents, should be removed from the fibre by scouring at 75–80°C. with 1 gram/litre Tinovetin CW. The material is then preferably treated in the dyebath set at 60°C., with only Irgasol PMC and Irgasol DA, for 5 mins. and the well dissolved Maxilons are then added. They are dissolved by pasting with acetic acid and then pouring on boiling water. Temperature is raised slowly to the boil, taking particular care between 80°C. and the boil where rapid up-take of colour occurs. A maximum rate of increase of no more than 1°C. every 2–3 mins. is recommended and this should be slowed down more when dyeing yarn, which is the most difficult form of the fibre to dye level. Boiling for 1–1½ hours completes the process. If shading colours are required, the bath should be cooled to 80°C., the colour added and the temperature once again raised slowly to the boil. The resultant shades have outstanding fastness to most treatments and in particular to light and washing.

One of the most difficult shades to produce on "Orlon" with good light fastness is a black. The dispersed dyes are no use in this respect and the most convenient method involves the use of basic dyes. A good black can be obtained with the old type basic colours from an acetic acid/sodium acetate dyebath, but the light fastness obtainable is normally only about 3–4. Using Maxilon colours, a light fastness of 7–8 can be obtained but the colour cost tends to be prohibitive and the black produced is not very dense. We have found it possible, however, to get the best from both groups, and by judicious selection of normal basics in combination with Maxilons it is possible to get a good black of light fastness 5–6.

Acid and Chrome Colours

On "Orlon," the acid colours are of minor importance, because of the difficulty in application. Under normal acid dyeing conditions, these colours have virtually no affinity for "Orlon" and can only be applied by the cuprous-ion technique. This method requires careful control to obtain the best results and only selected colours are satisfactory.

On Acrilan, because of the presence of basic groupings in the fibre molecule, acid colours can be dyed by a comparatively simple method. The only disadvantage is that large additions of acid are required and care must be taken to neutralise the fibre after dyeing to preserve the soft handle.

In fastness properties, the ordinary acid colours and strong acid dyeing chrome complex colours (Eriolan dyes) as a range offer little advantage over the dispersed and dispersed/Maxilon Red BL combination, except in certain shades on brightness grounds. They are only recommended for pale to medium shades, as above these depths the wet fastness properties fall off rapidly and careful selection of colours is required to give best light fastness.

The neutral dyeing chrome complex colours of the Irgalan type, while giving very good fastness to light and washing are only of use in pale to medium depths (up to 4%). In shades such as grey, fawn, lovat, etc., the fastness to light, milling and wet treatments is very good and these colours are extensively used for dyeing "Acrilan" in loose and slubbing form. Where maximum fastness to milling, light and wet treatments is required, in medium and heavy shades at reasonable cost, the chrome colours are unsurpassed and are used for shades such as nigger, maroon, navy and black on loose "Acrilan" and slubbing. The dyeings methods for these colours are basically the same and vary only in the acid added at commencement of dyeing.

Acid and Eriolan Colours

Dyeing is commenced at 40–50°C. in a bath containing 1–2% formic acid 85% (or sulphuric) and 1–2% Irgasol PMC. The temperature is raised to the boil in 45 mins. and after 20 mins. at the boil, 4% sulphuric acid (well diluted) is added and boiling continues for 45–60 mins. The Irgasol PMC is added as an anti-precipitant and its use is necessitated by the fact that the high concentration of acid used may cause precipitation of certain colours. Exhaustion is normally complete with comparatively small additions of acid but, at this stage, the fibres are only "ring" dyed. Further acid additions and continued boiling are required to complete the penetration. The use of such large quantities of acid makes the fibre somewhat harsh and necessitates the neutralisation of the fabric after dyeing. Low temperature neutralisation is little use, as only the surface of the fibres is affected, and treatment for the best result is carried out for 20–30 mins. with 1 gram/litre Tinovetin CW and 0·5 grams/litre soda ash at 65°C.

Irgalan Colours

The method is similar to that outlined for the acid and Eriolan colours but dyeing is commenced with 0·5–2% acetic acid 80% and 1–2% Irgasol PMC.

Chrome Colours

The dyeing of chrome colours is done once again by a similar method to that used for acid colours, using formic acid and Irgasol PMC at the commencement of the dyeing. These dyes are supplied by an after-chrome method and it is during the chroming process that most troubles are likely to occur. A problem which may often occur on "Acrilan" is a shade variation due to overchroming, and which can only be avoided by modifying the chroming method as follows:

After dyeing the material is rinsed with boiling water and then chroming commenced at the boil using 1·25%–3% bichrome and 1–2% formic acid 85%. After 30 mins. at the boil, sodium sulphite crystals equal to half weight of bichrome used, are dissolved in water and added to the bath. Boiling 30 mins. completes the chroming process and neutralisation is carried out as previously recommended. Where heavy shades are being chromed (e.g. blacks) it may be preferable to use sulphuric acid and larger quantities (4%) of bi-chrome.

"Acrilan"/Cellulosic Blends

Blends of "Acrilan" with viscose in the proportion 70% "Acrilan" to 30% viscose are now appearing in reasonable quantities. A variety of effects can be produced on such fabrics by reserving one or other of the two fibres, or dyeing two tone and solid shades. Such blends often require a desizing treatment prior to dyeing, in addition to the normal scour.

The "Acrilan" can be dyed by a variety of methods but, in general, the dispersed dyes including Maxilon Red are convenient to use and give satisfactory fastness. In selected cases Irgalan (pale shades) and chrome dyes (heavy shades) may be used where exceptional fastness is required, bearing in mind that very careful neutralisation of the goods is required to avoid tendering the viscose at a later stage. The cellulosic portion of the blend is conveniently dyed with directs, aftertreated directs, Cuprophenyl type or even vat dyes.

If dispersed dyes are used on the "Acrilan," with the intention of reserving the viscose it is usually necessary, with the exception of pale shades, to clear the staining from the viscose by one of the normally recommended methods e.g., Clarite PSE or permanganate/bisulphite. Acid and chrome colours (and Maxilon Red) will, on the other hand, generally leave the viscose white. When the reverse effect is required, i.e. viscose dyed and "Acrilan" reserved, one must remember that "Acrilan" is slightly stained by most direct dyestuffs. If perfect reservation is

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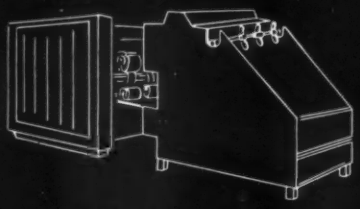

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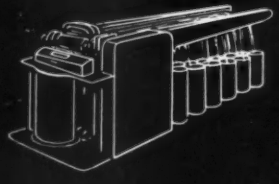

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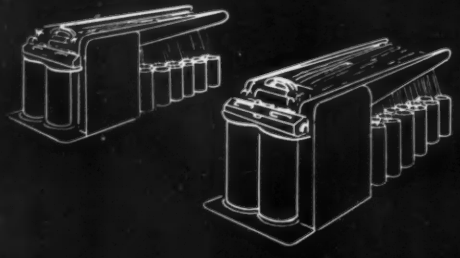

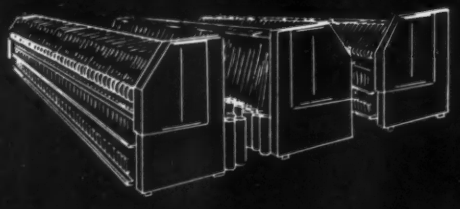

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required, it is necessary to pre-treat the "Acrilan" with a product which will prevent the staining. Such a product is Erional NW, which can be applied at 3% o.w.f. for 60°C. for 15 mins. before the colour is added to the dyebath.

Solid shades and two tone effects can be easily produced by a single bath method using a combination of selected dispersed and direct dyes. If the shades are such that cross staining of the "Acrilan" by the direct dyes is undesirable, a pre-treatment with Erional NW may be given. The dyeing method is the same as that for the dispersed dyes on "Acrilan," namely, using 0·5–1 gram/litre Eriopon CW and dyeing at the boil for 1½–2 hours, except of course that when the viscose is to be dyed with direct colours, gradual salt additions are required to facilitate exhaustion.

Where Maxilon Red BL is used along with the dispersed dyes for heavier shades on the "Acrilan," direct dyes can still be used in the same dyebath without danger of precipitation, provided the precautions outlined for Maxilon Red BL are adhered to. It is important to ensure that no Erional NW is added to the bath when Maxilon Red is used, otherwise poor colour yield is obtained. Similarly, Cuprophenyl type colours can be used in the same bath as Maxilon Red BL and dispersed dyes, provided those Cuprophenyls are selected which can be dyed satisfactorily under neutral conditions.

If the "Acrilan" is dyed with chrome dyes or Irgalan colours, the viscose must be filled in from a fresh bath after neutralisation and similarly, where the viscose is required to be vat dyed, this process must be carried out in a fresh bath by the normal method, after first dyeing the "Acrilan." The cross dyeing with vat dyes has negligible effect on the dispersed colours and Maxilon Red.

Black shades are always of interest and not least on "Acrilan"/viscose. The method described for dyeing "Acrilan" black with a dispersed Diazo Black/Irganaphthol RTO leaves the viscose sufficiently white to give a clerical grey effect, although the slight staining can be cleared if necessary by Clarite PSE. The black produced by this method can be converted into a solid black shade by cross-dyeing with Cuprophenyl Black RL to give a shade of excellent all-round fastness. This method can be shortened by dyeing the viscose with a direct black in the same bath as the Setacyl Diazo Black GND. Obviously a black should be selected which will stand the diazotisation, and such a black is found in Formal Fast Black BR. The result obtained, even without after-treating, is fast to S.D.C. Wash Test No. 2.

"Orlon"/Cellulosic Blends

The "Orlon" portion of these blends can, of course, be conveniently dyed with dispersed dyes and basic colours, and the methods for dyeing the blended fabric is based on the use of these two classes of colour, along with suitable colours for the cellulose. The production of pale solid shades, and two tone effects where the "Orlon" is dyed to a pale shade, is comparatively simple and involves the use of dispersed and direct dyes by a single bath method at the boil. The method is basically the same as that used when dyeing "Acrilan"/viscose with similar combinations.

When Maxilon colours are used for the "Orlon," the method must be modified, as direct dyestuffs are not compatible with the Maxilon colours in presence of acid and Irgasol DA as used in the "IT" method. Therefore, the "Orlon" should first of all be dyed by the normal "IT" method and after about 1½ hours at the boil, when complete exhaustion has been obtained, the temperature should be reduced to 85–90°C. and cross-dyeing with selected direct dyes carried out by the normal method in the same bath. There is, of course, very little staining of the cotton by the Maxilons and therefore, control of the shade is simplified. Reduction of the dyebath temperature is intended to prevent shade variation on the "Orlon" due to the partial stripping effect of glauber's salt on the basic colours at the boil. If faster results are required on the cellulose, Cuprophenyl colours or vat colours may be applied, but a fresh bath should be used for the cross-dyeing.

When the "Orlon" is required to be dyed black, either for solid shades or to leave viscose white, it is necessary to use basic dyes. While the Maxilons do not give a full dense black, they will give a sufficiently good result to pass on this type of fabric and of, course, are particularly useful because of their viscose reservation. Alternatively, the ordinary basic colours can be used provided some cross-staining of the viscose can be tolerated. Excellent blacks can be obtained by this method, and in certain cases the viscose can be cleared of staining by the use of permanganate/bisulphite.

"Courtelle"

"Courtelle" is the acrylic fibre manufactured by Courtaulds Ltd. Essentially its dyeing properties are the same as those of "Orlon," in that it is preferably dyed with dispersed dyes in pale shades and with basic dyes (Maxilon) in medium and heavy shades. The big difference lies in the tendency of "Courtelle," under high temperature steaming conditions, to generate alkalinity. Thus colours fast to steam pleating or decatising on "Orlon," may fall down in this respect on "Courtelle," if they are sensitive to alkali at high temperatures. The colours most affected are the Maxilon Blues and they should not be used on "Courtelle" which may undergo steam pleating or decatising. Thus, while combinations of Maxilons on "Courtelle" are eminently suitable for knitwear, they cannot be recommended on, say "Courtelle" slubbing, which is blended with wool and finally pleated or decatised.

In any event, because of this property of "Courtelle," it is suggested that prior to dyeing with basic type dyestuffs, the material should be given an acid scour with 1 gram/litre Tinovetin CW and 2·5 grams/litre acetic acid 40% at the boil for ½-hour.

Solving a Slasher Problem*

A NEW member of the Acrysol family of sizing agents, identified as Acrysol P-6, is proving effective in solving the troublesome problem of sizing "Dacron"† filament yarn. It adheres tenaciously to the yarn, maintains the required flexibility during weaving, and is readily removed by a light scour when the gray goods are processed.

The application of size is essential in preparing warp. The sizing compound forms a coating on the yarn, protecting it from chafing and breakage during weaving and in the case of filament yarns helps to maintain the twist which is applied as the several strands of filament are combined to form a single thread.

With cotton yarns, sizing is readily accomplished, for the cellulose fibres are easily saturated with the aqueous solution. It is a different story with modern synthetic fibres, however, for ordinary starch sizes do not adhere properly to the hydrophobic filaments, and they are too brittle to conform to the springy suppleness of the fibre.

A different sizing compound is usually required for each different type of synthetic fibre, and the various products in the Acrysol group of sizing agents have been developed to meet these specific needs. Acrysol P-6 is the particular member of the group prepared for use on "Dacron" polyester fibre. It is supplied as an emulsion with a pH between 3·0 and 3·5. When this pH is adjusted to between 7·0 and 8·0, with sodium hydroxide, a clear solution is formed. Two per cent. sodium hydroxide, based on the weight of the emulsion, is the recommended concentration for preparing the sizing formulation. The prepared size shows no tendency to form a scum in the mix kettle or the slasher box.

Conventional slasher procedure is used in the sizing operation. The warp is fed into the slasher box where the Acrysol formulation is held at approximately 140°F. As the yarn leaves the box it passes through nip rolls set for a pressure of 1,200 lbs. and then goes on to steam-heated drying cans. Slasher speeds of 25 to 35 yds./min. are readily maintained. Properly prepared solutions of Acrysol P-6 have no harmful effect on mixing kettles, pipe lines, size boxes, rollers or dry cans. The dried, sized yarn will not harm the drop wires, healds, reeds or other parts of the loom.

Extensive commercial use has shown Acrysol P-6 to be a highly efficient sizing agent for filament "Dacron." It forms a tough, flexible coating on the yarn that protects the strands from damage under the mechanical abrasion of the loom parts, and the tenacious bond between the fibre and film virtually eliminates shedding or flaking during weaving.

* *Rohn and Haas Reporter, Vol.* 15, *No.* 6.

† *"Dacron" is a trade mark of E. I. du Pont de Nemours and Co.*

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End Uses of Synthetic Fibres

PROCESSERS and producers were both interested in the end-uses of synthetic fibres, but for rather different reasons, stated Mr. L. A. Wiseman, B.Sc., A.R.I.C., director of research, British Rayon Research Association, in a recent address to Macclesfield and Leek section of the Textile Institute. The processers had to accept the properties of the fibre as marketed at any given time and would, naturally, want to be in a position to decide which fibre was most appropriate for a given end-use, so that they could get a marketable product. The producers were also interested in this aspect of the question, and in discovering those defects, which prevented a fibre from being most effectively and competitively applied to a given end-use, with the objective of removing them.

Pointing out that the producers could alter certain physical characteristics of the fibre, such as denier, staple length and cross-section, without necessarily altering the physical properties of the fibre to a great extent, Mr. Wiseman said other things could be altered but at the cost of restricting the possible use of the fibre. For example, it seemed to be fairly well established empirically that if the tenacity of the fibre were increased then the elongation at break would decrease and the shape of the stress strain curve would change, but the situation became more complicated when the producer was asked to change certain properties of the fibre (which might be undesirable in some applications) by modifications to the chemical structure of the fibre. Thus, if the producer were asked to improve the water absorption by changing, even slightly, the chemical nature of the monomer from which the fibre was produced, the result would probably be the production of a fibre with different physical properties, which would then have to be re-evaluated and would possibly be suitable for a completely different set of end-uses. In particular, there was no assurance that if, say, the water absorption capacity of the fibre were increased intrinsically the fibre would still have usable thermoplastic properties. Much could be done to alter the surface properties of a fibre, but the problem here was to do this economically and to provide a surface alteration which would be durable after repeated washing operations. In considering synthetic fibres, whilst the audience (mainly throwsters and uptwisters) was perfectly aware that continuous filament fibres had a large market, it was well worth while bearing in mind that the advantages of continuous filament fibres, such as greater strength, could be used in fabric construction more extensively than seemed to be the fashion at the moment. The other unique property of the synthetic fibres currently in use in this country was that they were thermoplastic, and had provided a large range of yarn and fabric effects by virtue of the fact that they could be "bulked," and in some cases set, i.e. made dimensionally stable.

Mr. Wiseman then went on to discuss the properties of fibres which were normally measured and considered in some detail what information could be obtained from the stress/strain curves available. Two properties which could be derived from the stress/strain curve—and which had been used to some extent in understanding the behaviour of fibres—were the initial modulus and the compliance ratio. This information, together with a certain amount of information on the creep recovery of fibres could be used in a qualitative way to explain the reason why certain fibres were more successful than others in a number of specific applications.

In using this data, however, it was pointed out that the mere statement of an end-use did not permit one to determine the appropriate fibre except on the basis of experience. It was essential to determine what mechanical and physical properties a fabric—and the yarns constituting it—must have to achieve this end-use. This was illustrated by a discussion of the different mechanical properties required of the yarns in a rope in different types of usage. In Mr. Wiseman's opinion the most urgent requirement at the moment was not the determination in even greater detail of individual properties of textile fibres, but an analysis of fabric structures to determine what properties were required in the fibre in order to achieve qualities such as crease-resistance, and to determine how to use any one fibre most effectively.

Currently there was competition between nylon and "Terylene," with the threat of intense competition from the acrylic fibres, such as "Acrilan" and "Courtelle." In certain applications there were clear-cut advantages offered by one fibre over the other. Thus, nylon had very good abrasion resistance, a low density and good creep recovery from large strains, and these properties had given it a clear-cut advantage in socks, stockings and light-weight garments such as lingerie, and certain industrial applications. "Terylene" had excellent pleating properties, good resistance to acids, good retention of strength at 100-150°C. and an abrasion resistance better than fibres other than nylon. These properties had been exploited in "Terylene" blends in worsted suitings, in industrial applications such as paper-makers' felts and many other fields. "Acrilan," while being a weaker and less abrasion resistant fibre than nylon or "Terylene," had a very pleasant "handle" and it would be interesting to see how far the exploitation of this property in knitwear and blends with wool would displace the other two fibres.

Finally, Mr. Wiseman referred to some work which had been done on the crease recovery properties of blends of "Fibro" with a number of other fibres, including "Terylene," cellulose triacetate and nylon. This data was compared with similar data on different fabrics obtained by two other groups of workers, and while the general agreement was fairly good, there was no more than fair correlation with factors such as initial moduli, creep recovery, work on strain, etc. These results were for staple yarns and it was suggested that a factor which had been ignored very largely, was the friction between the fibres in the staple yarn.

In summarising, Mr. Wiseman agreed that the measured physical properties of fibres could be used to give a reasonable qualitative account of how they would behave, in general, in fabrics, but stressed that there was no sure foundation for extending this work further until a much better understanding had been obtained of what a fibre was asked to do in a fabric for a specific end-use.

U.K. Wool Imports

Imports of raw wool into the U.K. during March were 71·7 mill. lbs. (actual), the largest total for any month since March last year. Trade and navigation accounts (B.o.T.) show that, 26·6 mill. lbs. represented Australian wool, 20·3 mill. lbs. New Zealand wool, and 6·4 mill. lbs. South African wool. During the Jan./Mar. quarter of 1958, imports of wool into the U.K. totalled 182·7 mill. lbs., compared with 212·9 mill. lbs. in the first quarter of last year. Of the 182·7 mill. lbs. imported in the past three months, Australia supplied 78·8 mill. lbs., New Zealand 55·0 mill. lbs., and South Africa 14·9 mill. lbs. Britain's exports of merino tops were 12·5 mill. lbs. in the first quarter of this year, some 2 mill. lbs. in excess of the comparable period of last year, but a decline of nearly 2 mill. lbs. was shown in exports of crossbred tops. On balance, total exports of tops were fractionally under last year's comparable period at the end of the first quarter.

Materials Handling

The National Joint Committee on Materials Handling, a co-ordinating committee for professional and other bodies interested in materials handling, particularly from an educational standpoint, has compiled a list of films on materials handling which is now available upon receipt of a stamped addressed envelope, from The Secretariat, National Joint Committee on Materials Handling, 20/21 Took's Court, Cursitor Street, London E.C.4. Some sixty titles are listed showing the size and running-time (where known), the source of film and a brief synopsis of its purpose and audience suitability.

Exhibition of Fabrics in Man-made Fibres

An exhibition of fabrics in man-made fibres, especially designed for the new "supple silhouette" trend in fashion, is now on view at Hamilton House, 138 Piccadilly, W.1, the London headquarters of the British Man-made Fibres Federation. Fabrics from the Spring 1959 ranges of some fifty manufacturers will be displayed, demonstrating the eminent suitability of man-made fibres for the flexibility of handle which fashion is now demanding. The exhibition will remain open until June 13th.

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Book Reviews

SURFACE ACTIVE AGENTS AND DETERGENTS. A. M. Schwartz, J. W. Perry and J. Berch. Second volume. Interscience Publishers, New York and London. 1958. 839 pages (price £6 0s. 0d.).

In view of the many new developments in surface active agents the authors found it advisable not to publish a revised edition of their previous book "SURFACE ACTIVE AGENTS (Interscience Publishers, N.Y. and London; 1949), but to write a new volume altogether and to include synthetic detergents. The two authors, Anthony M. Schwartz, Harris Research Laboratories, Washington, D.C., and James W. Perry, Center for Documentation and Communication Research Western Reserve University, Cleveland, Ohio, were joined by a third co-author, Julian Berch, Harris Research Laboratories.

In its contents the authors follow, to some extent, the pattern set in the first volume, namely describing first the processes for synthesizing and manufacturing surface active agents, explaining the fundamentals of physical and colloidal chemistry of such products, and enumerating their wide application in industry. In the introduction, they consider some economic aspects and publish statistical tables of the U.S. production of detergents by types and of the U.S. total solid and liquid detergent sales. Although the anionic detergents, particularly alkyl/aryl sulphonates, continue to dominate the field in terms of total poundage, the growth of nonionic surfactants has been not less spectacular, due to their expansion in the industrial and agricultural fields.

The use of synthetic detergent compositions for washing and cleaning operations in textile manufacture has increased steadily, apart from their extending use in household laundry compositions. The synthetics are also used in raw wool scouring, in washing woollen piece goods, in continuous bleaching processes for cotton, rayon, and other fibres, in boiling-off rayon and synthetic fibres, such operations being carried out with anionic or nonionic synthetic detergents together with condensed phosphate or silicate builders. They are also often used in washing fast prints and dyeings, and as anionic and cationic finishing agents for cotton, rayon, and synthetic fibres.

In the chapter on practical applications of surface active agents the authors describe their use in the cosmetic, pharmaceutical and medicinal industries where wetting and spreading power is an important factor in many topical remedies and lotions for use on the skin, while emulsifying and solubilizing power, two other important aspects of surface activity, are of great importance in the formulation of ointments. Such products are also used in the metal, paper, fur, and building industries, in the flotation of metal ores, in paints and coatings, in fire-fighting, and also in the chemical processing industries. There is an author and subject index, and many diagrams and tables within the text. Numerous references to the world literature and patents are quoted. The second volume is well printed and produced. It will be eagerly studied by all those concerned or engaged in this attractive field of chemistry and chemical technology.

B.S.

* * *

TEXTILE CHEMICALS AND AUXILIARIES. Edited by H. C. Speel and E. W. K. Schwarz. Reinhold Publishing Corp., New York, and Chapman and Hall, Ltd., 37 Essex Street, London, W.C.2. 1957. 544 pages (price £5 10s. 0d.).

This book, now in its second edition, deals primarily with the vital role of chemicals, dyes, surface-active and finishing agents, and textile auxiliaries in the modern textile industry. It begins with a discussion of physical and chemical properties of natural and synthetic fibres, also with chemical and physical identification methods of textile chemicals. Separate chapters then describe the various preparatory processes for loose material, yarns and fabrics, the dyeing and printing of textiles, with a special section on textile printing with pigments; the authors also discuss causes and prevention of fabric shrinkage, either by mechanical or chemical methods, and with the production of coated fabrics. A chapter new in this edition is on felts and non-woven fabrics, one of the fastest growing branch of the textile industry in U.S.A., made possible by the use of thermoplastic fibres and thermosensitive bonding agents.

The contents of the first part serves as a background for the second part of the book, which describes the individual types of auxiliaries, such as water softeners, fats, oils, anionic, nonionic and cationic surface active agents, and softeners, synthetic resins, special finishing agents, etc. Miscellaneous auxiliary products, such as sequestrants and dispersing agents, are dealt with in the last chapter in which the editor, H. C. Speel, also surveys some of the economic aspects. He states that more than 25% of all the chemicals produced in U.S.A. is consumed by the textile producing and processing industries. There are references to literature and patents at the end of each chapter. Manufacturers of chemicals, textile research chemists and technicians will find the book extremely valuable and stimulating in their work and studies.

B.S.

* * *

THE WOMEN'S OUTERWEAR INDUSTRY. Margaret Wray. Gerald Duckworth and Co. Ltd., 3 Henrietta Street, London, W.C.2 (price 30s.).

The primary purpose of the "Industrial Innovation Series," of which this book forms part, is to elucidate facts and assess the relationship between innovation and structure in each of the several industries examined. Dr. Wray's report is based mainly on case data study undertaken in as many factories as possible, supplemented by interviews with representatives of trade organisations, the trade press, machinery suppliers and others concerned with the industry's progress and by information on marketing obtained from department and multiple stores. The ground is cleared in the first chapter in which the author discusses the more important pre-war innovations in clothing machinery, factory production developments, the pre-war structure of the industry, and pre-war marketing methods. Chapter II recounts the changes in the industry caused by war-time conditions, with special emphasis, of course, on government controls and the utility clothing scheme. (Dr. Wray is well fitted to judge the effects of these controls as she herself served as a controller.) Apart from structural changes, austerity restrictions brought about increased adoption of mass-production methods, so that, in the immediate post-war years, profits and experience could be applied to production under easier labour conditions. Dr. Wray then turns to the consideration of the years 1951-55 when a new pattern of demand emerged, influenced larger by the changed distribution of the national income, by fashion and by increased consumer advertising, all of which led to a less predictable market demand. Statistical data are introduced in this chapter to indicate the size, distribution and location of women's outerwear production. Part II of the book, which follows, examines post-war innovations in production methods, changes in management and management and operative training, channels of communication by which knowledge of such innovations circulates throughout the industry, and also refers to organisations and training facilities developed to improve productivity in British industry generally. Innovations in marketing and the current patterns of distribution of the industry's products are the subject of Part III. Part IV covers case study data; the production methods observed in factories visited are described and production methods correlated with marketing, in the three main sections of the industry. The chapters on tailoring and blouse production include a discussion of outdoor factory production and the contribution made by home-workers. The author's conclusions about the importance of technical innovations are set down in Part V, which is followed by a "Theoretical Appendix" which attempts to re-state the empirical conclusions reached in Part V in terms of economic theory so as to provide common ground for relating them to conditions in other industries. For women's outerwear, the principal conclusions to be drawn from such empirical data are that, although the industry is, in general, highly competitive in structure, the most progressive firms technically are those whose markets have an element of imperfection, because of their consumer advertising or because of their concentration of sales on one or a few multiple groups. The volume, which ends with an excellent bibliography, is a most important contribution to the literature of the clothing industry.

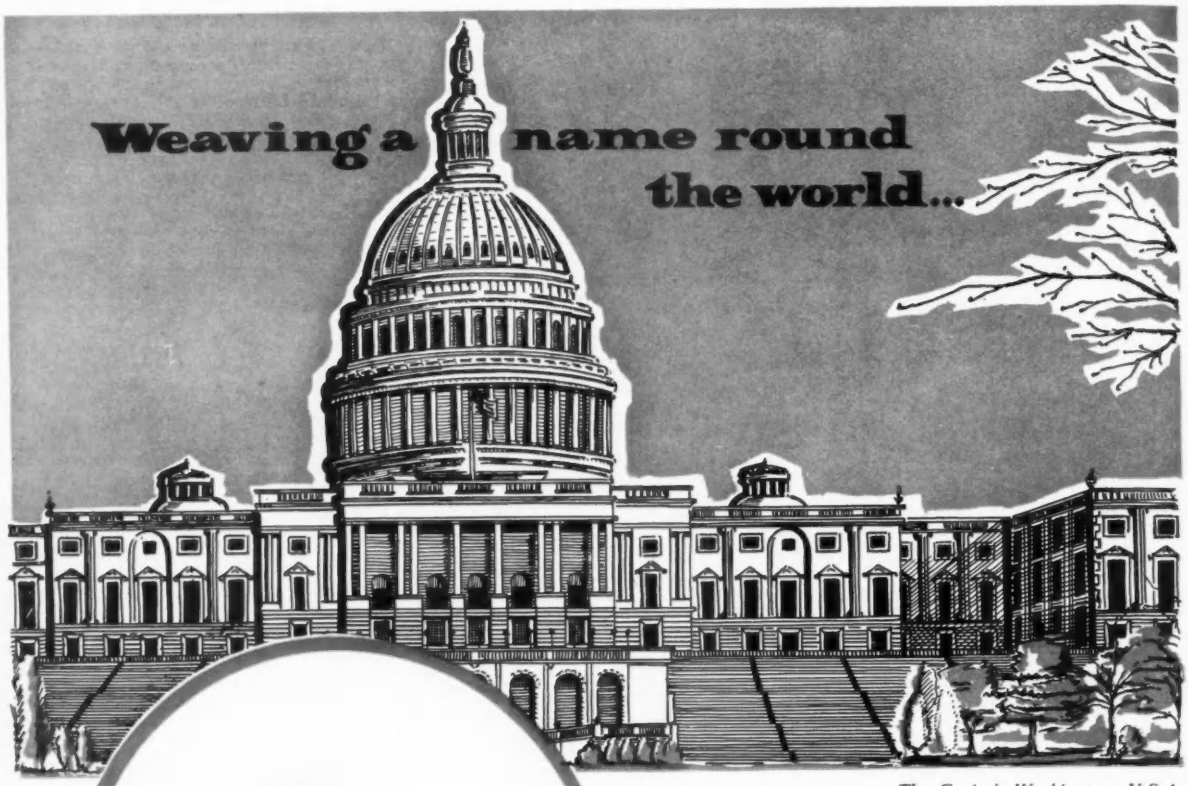
S.P.S.

* * *

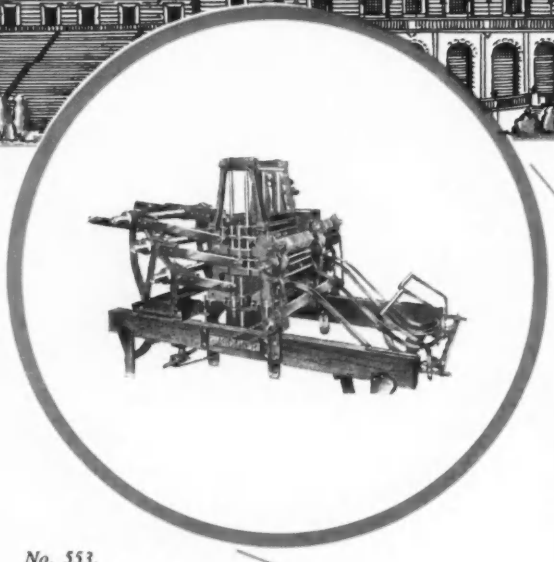
YORKSHIRE TEXTILE INDUSTRY. John Worrall Ltd., Central Works, Oldham (price 30s.).

The 1958 edition of this well-known directory has the familiar format and, as usual, contains a mass of information. The general section has an index to towns and villages and an alphabetical index to firms appearing in the directory section. A classified list of trades is followed by yarn producers, yarn processors, a finishing section (cloth), a standard list of fabrics

Weaving a name round the world...



The Capitol, Washington, U.S.A.



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and other useful information. A commercial section includes British and Associated Chambers of Commerce and other British organisations overseas, the London Wool, Terminal Market Association, research and testing facilities, textile societies, trade enquiry offices in London of the Dominions, Colonies, etc., also U.K. representatives overseas. The statistical section is a valuable reference work on consumption, deliveries of yarn and fabrics and stocks of wool and tops in the U.K. The buyers' guide is in four sections: (*a*) machinery, accessories, etc., (*b*) chemicals, auxiliaries, oils, etc., (*c*) raw materials, yarns, tops, waste, etc. and (*d*) piecegoods, manufacturing, merchanting, etc. The value of this section would be increased considerably if addresses were given with all the firms included. It is rather irritating to look for a name and then search somewhere else for the address.

D.A.

* * *

JAPAN'S ECONOMIC RECOVERY. By G. C. Allen. Oxford University Press, Amen House, Warwick Square, London, E.C.4 (price 25s.).

Over thirty years' experience as a student and investigator of the Japanese economy provides a most suitable background for Professor Allen's critical study, issued under the auspices of the Royal Institute of International Affairs, of Japan's economic resilience. The author is not concerned to trace in detail Japan's modern economic history and refers but briefly to significant events, upheavals and crises of the 1930's, during which years those remarkable organisations known as the Zaibatsu shared with small-scale manufacturers in a general industrial advance, the domination of the former only being weakened by State assumption of control over certain basic industries for strategic reasons. Far closer examination is made of the post-war years, beginning with the seven-year period of direction by S.C.A.P., and including the Korean War boom. Separate chapters are devoted to consideration of various sectors of the economy, including one dealing with the textile industries and another with the recovery of the Zaibatsu and their influence on Japanese economic resurgence.

Two further chapters describe the problems presented by the rise of the trade unions and the consequent changes in industrial relations and review Japan's difficulties and successes in the export trade. An appendix, containing 26 tables, furnishes statistical data for a full appreciation of the main text. A book full of facts, figures and wise observations on a subject of interest to a wide circle of readers.

S.P.S.

* * *

FABRIC AND CLOTHING TRADES INDEX, 1958. Kemp's Public Relations Services Ltd., 299-301 Grays Inn Road, London, W.C.1 (price 21s.).

Previous editions of the index have gained a deservedly high reputation for their usefulness, not least because of the articles on special topics they have contained. The 1958 edition maintains this tradition by including articles specially written by experts on women's sizes, children's wear, millinery, wool and man-made fibres. The reference pages are extremely easy to consult and are well indexed. A helpful feature is the list of branded names, extending to nearly sixty pages. Lists of trade associations and publications are also included, in addition to classified London and provincial lists for textiles, furs, millinery and hats.

* * *

DIMENSIONS OF FLYER BOBBINS AND SKEWERS (B.S. 1836 : 1958). British Standards Institution, 2 Park Street, London, W.1 (price 4s.).

First published in 1952, this British Standard has been revised to bring it into line with the recommendations of the International Standards Organisation. Flyer bobbins complying with this standard are not wholly comparable with bobbins made to metric dimensions, but both products are interchangeable. "ISO" recommendations for skewers have not been formulated, because continental and U.K. spinning practices differ. Dimensions have, however, been fixed for spindle diameters and these are included. The standard specifies dimensions for flyer bobbins and skewers made from wood, light alloys or plastic materials.

* * *

DIRECTORY OF EMPLOYERS' ASSOCIATIONS, TRADE UNIONS, ETC. H.M. Stationery Office, price 8s. 7d., post free.

A new edition of this directory has been compiled by the Ministry of Labour and National Service. It contains the title and name and address of the secretary of every organisation in the U.K. of employers, of workers and of employers and workers jointly, directly concerned with the negotiation of wages and working conditions, or which provides representatives on bodies which are so concerned.

* * *

ECONOMIC AND COMMERCIAL CONDITIONS IN CHILE. H.M. Stationery Office (price, by post, 7s. 7d.).

A more favourable trade and exchange system was introduced two years ago and as a result U.K. exports to Chile took an upward turn in 1956 when their total value was 18% higher than in 1955, despite a reduction in Chile's imports that year from all sources. U.K. exports improved in 1957 by 31% over 1956, and again show a good increase in the first quarter of this year. Our exports of machinery have more than doubled since 1955. Development of the Chilean economy has led to a steadily expanding demand for capital goods but there is also a market for a wide range of specialised articles which Chile does not manufacture. Details of these are given in the survey.

Trade Literature

OVERSEAS NEWSPAPERS AND PERIODICALS. 1958. Publishing and Distributing Co. Ltd., 177 Regent Street, London, W.1.

This excellent guide to the overseas press, classified, first of all under more than 50 headings and sub-divided by countries, and secondly arranged under the name of each country. The information given about each publication includes circulation figures and advertising rates. A final section lists overseas annuals, who's who and press guides. Copies of the guide are available free of charge to firms planning overseas advertising campaigns.

* * *

WATER PURITY. Three auxiliaries whose purpose is to widen the range of applications of the "Dionic" water purity meter produced by the Company, are dealt with in publication No. 328 issued by Evershed and Vignoles Ltd., Acton Lane Works, Chiswick, London, W.4. The Evershed water cooler reduces very high temperature test water to a temperature within the working range (60°-160°F.) of the "Dionic" meter, whilst the company's steam condenser reduces test steam to condensate at a temperature suitable for testing. The degree of steam purity attained in some industries nowadays is so high that the readings of the purity meter can be seriously influenced by any soluble gases present in the test condensate, and the Evershed-Straub degassing condenser is designed to overcome this difficulty.

* * *

B.N.S. BUYERS' GUIDE. British Nylon Spinners Ltd. have just published a new edition of their buyers' guide. The eighth edition, it is published in two separate volumes, one for apparel and household uses and the other for industrial uses. Both volumes are considerably bigger than before and include for the first time a section listing brand names. This makes it simple to identify the source of nylon fabrics, garments or other articles when only the brand name is known. There are over 1,100 brand names in the apparel and household goods volume and nearly 200 in the industrial uses volume. Copies of both volumes are obtainable from British Nylon Spinners Ltd., Promotion Department, 25 Upper Brook Street, London, W.1.

* * *

DIELECTRIC FLUIDS. Monsanto Chemicals Ltd., Monsanto House, 10-18 Victoria Street, London, S.W.1, have available a new booklet on the dielectric fluids, Aroclors and Pyroclor, and their use in capacitors and transformers. The fifty pages include many illustrations and graphs dealing with the properties of Aroclor dielectrics and their applications; the compatibility of Aroclor dielectrics with other engineering materials; and handling of the fluids. A comprehensive bibliography is included.

* * *

POLYVINYL EMULSIONS. A bulletin from British Oxygen Chemicals Ltd., Vigo Lane, Chester-le-Street, Co. Durham, describes the properties and main uses of Vandike polyvinyl acetate emulsions, used in textiles as adhesives, backing for carpets and nylon anti-snag treatment. They are also used as binders in non-woven fabrics and stiffeners for upgrading felts.

* * *

FIRE PREVENTION AND RESEARCH. Four reprints of articles which have recently appeared in different journals are available from The Joint Fire Research Organisation, Fire Research Station, Borham Wood, Herts. They are respectively: "Smouldering Combustion in Dusts and

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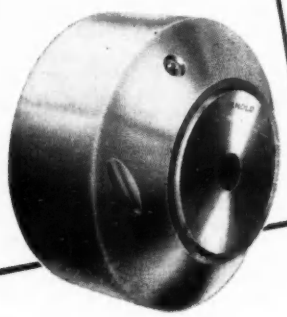

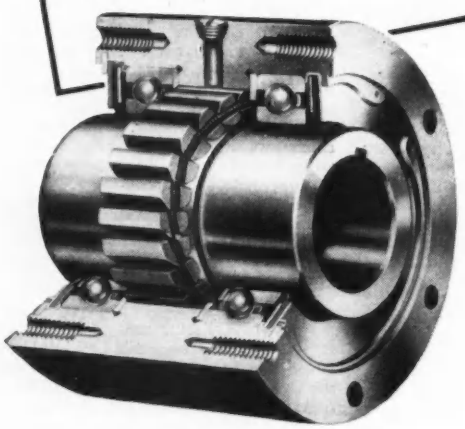

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* * *

COLOUR CARDS. The Autumn and Winter Colour Charts for 1958 are now available to members of the British Colour Council, 13 Portman Square, London, W.1. Many attractive new colours are presented in characteristic manner for wool, knitwear, cotton and silk and man-made fibres.

* * *

STEAM TRAPS. A comprehensive manual of excellent quality is now available on application to Drayton Regulator and Instrument Co. Ltd., West Drayton, Middlesex. Commencing with a list of steam trap applications, the manual gives details of operational methods, available types and data concerning them, and many other chapters of important steam trap information.

* * *

BRITISH INDUSTRIAL FILMS. The importance of the film as a valuable aid to productivity cannot be over-emphasised, and since British Productivity Council films were introduced they have been amongst the most heavily booked in the Central Film Library. A list of available films may be acquired from The Visual Aids Adviser, British Productivity Council, 21 Tothill Street, London S.W.1.

* * *

"TERYLENE" IN INDUSTRY. From I.C.I. Ltd., Fibres Division, Harrogate, comes an excellently executed, lavishly illustrated example of the printer's art. Printed on high quality art paper, the substance of the booklet is printed in four languages and contains much useful information outlining the industrial uses of "Terylene." Details of physical properties are included in tabular form.

* * *

HILGER JOURNAL. Hilger and Watts Ltd., 98 St. Pancras Way, London, N.W.1. A recent edition of this important company publication contains two main articles: "X-Ray Spectrochemical Analysis" by J. R. Stansfield, M.A., and "The Specification and Measurement of Colour" by M. Morris, B.Sc.

* * *

KLAXON HORNS AND MOTORS. A number of well-produced brochures are now available from Klaxon Ltd., 49 Upper Brook Street, London, W.1. They tabulate information and give specifications for the company's range of sirens, electric motors, signals and horns. All are fully illustrated.

* * *

ALUMINIUM NEWS. Aluminium Union Ltd., Post Office Dept., Ottawa, Canada. Beach and evening wear woven from aluminium yarns are appearing on the market and, as the photographs in a recent issue of this periodical show, enhance considerably the appearance of the fabric in which they are incorporated.

* * *

"TERYLENE" SUITING." An illustrated brochure from I.C.I. Ltd., Millbank, London, S.W.1, entitled "Upholding a Tradition," points to a growing use of "Terylene" in bespoke tailoring and gives brief details relating to "Terylene"/wool blends, shrinking, patterns and markings, shaping and stretching, pressing, etc.

* * *

ALUMINIUM ALLOY PRESSURE DIECASTINGS. An informative, profusely illustrated booklet from Fry's Diecastings Ltd., Brierley Hill Road, Wordsley, near Stourbridge, contains details relative to types of diecasting machine, alloys used, design features, machining and finishing processes in the manufacture of pressure diecastings.

* * *

USE OF CAPITAL. Management Consultants Assn., 4 London Wall Buildings, London, E.C.2. A recently issued pamphlet from this association deals clearly and factually with the dilemma of how to reconcile the needs of manufacturing industry to progress in a technological era with a shortage of new capital. The pamphlet shows that although new capital is always required much more intensive use can be made both of the existing assets and of the new equipment.

CONVEYOR BELTS. Five assorted publications illustrating conveyor belting, vehicle lighting and corrugated glass fibre roofing recently shown at the Mechanical Handling Exhibition have been produced by Rubber Improvement Ltd., Rilex Works, Wellingborough, Northants. Conveyor belting on show included Rilflex P.V.C. fire-resistant anti-static type, Leonex, and Rilon Green-for-Safety multiply beltings.

* * *

TORNADO FANS. Keith Blackman Ltd., Publicity Dept., Millmead Road, Tottenham, London, W.17, have released three new publications. Their titles are: "Tornado" type A.F.X. V-rope driven axial fans, "Tornado" type A.P.A. propeller fans and "Tornado" type E.K. V-rope driven centrifugal fans. Each of the foregoing catalogues provides comprehensive details of the relevant fan range, including specification, capacity tables, dimension drawings, fan laws and other valuable data applicable to the particular fan type.

Dyeing Cellulosic Fibres with Alcian "X" Dyestuffs

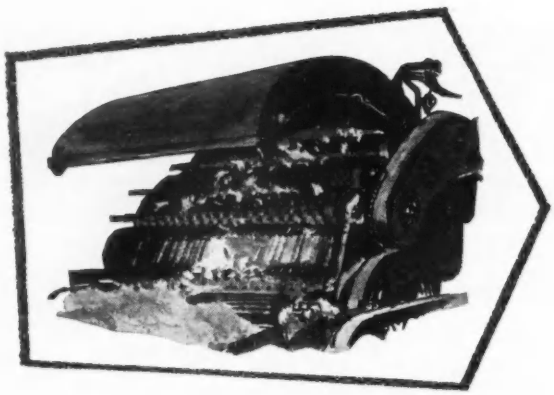
THE Alcian range was a speciality printing range but its introduction had also prompted considerable interest, particularly in the case of Alcian blues, in respect of their potential value for dyeing cellulosic fibres, said Mr. J. T. Turner (I.C.I. Ltd.) in a recent address to the Bradford Junior Branch of the Society of Dyers and Colourists. Experience to date had shown that, given careful control over the preparatory and dyeing processes Alcian Blue 8GX 300 could be applied successfully to a variety of cellulosic materials to give brilliant turquoise blue shades otherwise unobtainable with the same standard of fastness properties. Alcian Blues 7GX, 5GX and 2GX could also be applied satisfactorily by dyeing either in a mixture with each other or with Alcian Blue 8GX 300, thereby increasing the range of blue shades available from this class. For cellulosic dyeing, the blues were considered to be of main importance. Excellent penetration and levelness could be obtained, although irregularities in the dyeing properties of the fibres or in the cloth construction were not always covered completely in pale shades particularly in the case of viscose rayon fabrics.

Anionic wetting agents, detergents and dyebath assistants should not be employed with the Alcian "X" dyes owing to the danger of precipitation. When applied to correctly and uniformly prepared cellulosic textiles, the dyestuffs do not generally pose problems of unlevel dyeing. But in certain cases such as package dyeing and winch dyeing, a cationic restraining agent may be of value. When employed for dyeing caustic soda scoured or mercerised cotton and bleached linen, the Alcian "X" dyestuffs yield uneconomical dyebath exhaustion in excess of 1% dyeings.

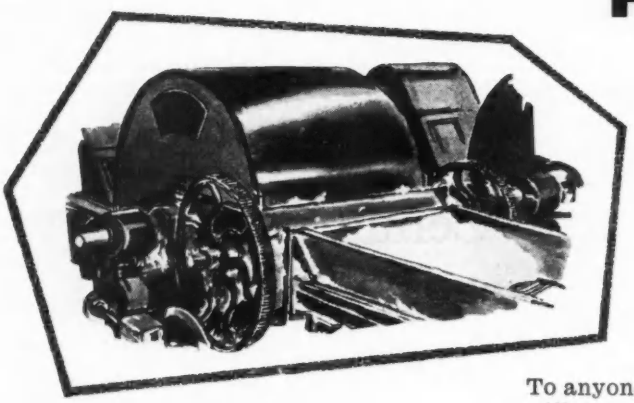
In the case of viscose rayon this stage is reached when approximately 0.7% has been absorbed. The degree of dyebath exhaustion when dyeing shades of these depths is very high but the addition of increasing quantities of dyestuff above these limits results in little or no increase in the amount absorbed by the fibres and no advantage is gained thereby. The affinity of Alcian "X" dyestuffs for cellulose varies appreciably with temperature and full advantage should be taken of this to obtain uniform and level absorption during dyeing, i.e. by starting the dyeing cold or at the lowest practical temperature and raising the dyebath temperature to the boil at a uniform rate and as slowly as permissible processing time will allow.

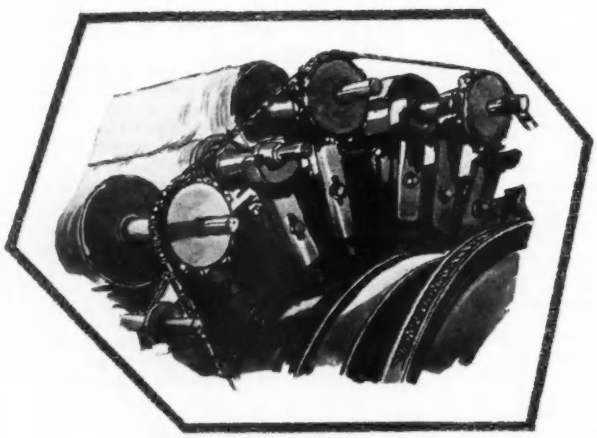
On cotton where shades in excess of 1% dyeings were demanded, the build-up could be promoted to a limited degree by the careful, step-wise addition to the dyebath of sodium acetate but resort should only be made to adding sodium acetate when absolutely necessary. Quantities in excess of about 2 parts per 1,000 parts of dye liquor should be added with great care, preferably in conjunction with a check of the dyebath pH which in any event should not be allowed to rise beyond ph 5. Sodium acetate was not recommended in viscose dyeing: on linen there was seldom need to dye over 1% shades.

In all cases of dyeing with Alcian "X" dyestuffs, optimum results were dependent on thorough preparation of the substrate. With cotton, a caustic soda boil was essential in scouring if maximum rubbing fastness of the final dyeing was to be achieved; kier-boiling, where practicable, was recommended. Bleaching of cotton, after the caustic boil, might be effected by treatment with hypochlorite or by oxygen-producing per-salts. With linen goods, the normal scour, followed by an acid-hypochlorite treatment and afterwards by a peroxide bleach had been shown to give satisfactory results.



DO YOU RECOGNISE THESE?





To anyone in textiles a rag grinder, a tenterhook willey and a carding engine are so familiar that they are hardly worth a second glance. But they are worth a second thought—for friction and foreign matter in these machines have been the starting point of many a disastrous fire.

Today, however, the fires that they cause in raw materials and fly can be stifled in seconds with a fine cloud of dry powder. Electrical and oil fires can also be killed completely, before they take hold. *Today is the new age of Nu-Swift.*

Every Nu-Swift extinguisher is designed to fulfil a specific function in a complete system of fire protection. There is a Nu-Swift extinguisher for every risk and every extinguisher is operated in the same upright commonsense way. That is why industry and commerce in seventy countries rely on Nu-Swift extinguishers for easy handling and certain operations.

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TMP6

Export Opportunities

Western Germany: Wool Tops

Karl Kritzler, Ruenderoth/Bez. Koeln, Oststrasse, is seeking agencies in wool tops of all kinds. He already represents Bradford wool importers and wishes to extend the range by taking on agencies of top-makers. For many years manager of a large worsted weaving mill in central Germany, he later set up as a commission agent in 1948. At present he represents three Bradford wool and wool waste merchants, two German wool importers and a shoddy mill. He also represents a German manufacturer of piece goods for women's and men's outerwear. Manufacturers interested should write direct also notify the British Consulate-General, Dusseldorf, Cecilien Allee 16.

Hong Kong: Towelling and Piece-Goods, etc.

Howah and Co. Ltd., 26, Des Voeux Road, Central, third floor, P.O. Box 707, Hong Kong, wish to represent U.K. manufacturers of terry towelling, cotton prints for women's and children's wear and cotton printed curtain material. Established in 1934, they are a firm of import and export merchants and manufacturers' agents, holding some 38 agencies mainly electrical fittings and upholstery fabrics but would like to widen their interests in view of the fact that they have connections with the garment manufacturers in Hong Kong. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, P.O. Box No. 528, Hong Kong.

Hong Kong: Woollen and Worsted Piece Goods

Davie, Boag and Co. Ltd., twelfth floor, Jardine House, Hong Kong, wish to secure an agency for fancy woollens and worsteds, principally 15-17 ozs. range of medium to high quality fabrics. They will, however, consider tropical weights and propose to act as commission agents selling to piecegoods wholesalers, tailors and garment manufacturers. An old-established firm of importers, exporters and commission agents, they have considerable experience in the textile field for they represent U.K. manufacturers of yarns, knitting wools, etc. Manufacturers interested should write direct to Mr. W. R. Huggan of firm, also notify U.K. Trade Commission P.O. Box No. 528, Hong Kong.

Western Germany: Men's Wear

The firm Benno Hannemann, Pulheim/Bez. Koeln Am Unterenweg 1, would welcome U.K. agency business for worsted suitings, camel hair waistcoats, ties, cardigans, pullovers and men's wear generally; they are only interested in goods of the highest quality. Established about 20 years ago, they are agents in textiles working on a commission basis and claim to cover the whole of Western Germany. Storage facilities are available. Manufacturers interested should write direct, also notify the British Consulate-General, Dusseldorf, Cecilien Allee 16.

Western Germany: Chintz Materials

Friedrich Neuhoeffer K.G., Dusseldorf, Himmelgeisterstrasse 334, want to contact U.K. manufacturers of chintz materials suitable for the lamp-shade industry. Established in 1919 as an agency, import and export business they deal in leather and plastics of all kinds and until recently operated on a commission basis, but now all transactions are on their own account. Sales are made to manufacturers, wholesalers and other large consumers. Manufacturers interested should write direct stating f.o.b. prices, also notify the British Consulate-General, Cecilien Allee 16, Dusseldorf.

Australia and New Zealand: Textiles, Machinery, Chemicals, etc.

Brown and Dureau Ltd., 422 Collins Street, Melbourne, are seeking agencies on a sole representation basis for machinery of all types, chemicals, and textiles. They will accept only such agencies as they consider themselves competent to handle with success. Established in 1883, they are now a public company with a nominal capital of £A 750,000, of which £A 600,000 has been issued. In Australia they have offices in every State capital and at Wellington, Christchurch and Auckland, in New Zealand. Manufacturers interested should write to Brown and Dureau Ltd., Finsbury Court, Finsbury Pavement, London, E.C.2, giving particulars of their undertaking and general details of their requirements. This information would then be referred to the sales director of the appropriate branch overseas for consideration and report as to the prospects of business.

South Africa: Dress Fabrics and Furnishings

Mr. F. Dunckley of E. W. Dunckley and Son (Pty.) Ltd., 96 Longmarket Street, Cape Town, at present on a visit to the U.K. for several months, would like to contact a U.K. manufacturer of cotton and rayon dress piece goods (prints) in the popular price category, also furnishing fabrics. The firm have offices in Johannesburg, Durban, Port Elizabeth and Bulawayo and cover the whole of the Union and the Rhodesias. They represent a number of U.K. manufacturers of textiles, knitwear, men's, ladies' and children's clothing and accessories. Manufacturers interested should write to Mr. Dunckley, c/o Barlow and Jones Ltd., 86 Princess Street, Manchester 1.

Israel: Consumer Goods

The British Embassy at Tel Aviv state that U.K. suppliers of consumer goods might do well to send details of their products to the U.S. Embassy in Tel Aviv. Of particular interest to the Americans are knitted woollen goods and blankets. Orders would not amount to large sums but if these were multiplied by corresponding orders from other American missions, some useful business might result. The Israel addresses to which details should be forwarded are:

Admin. Officer, U.S. Embassy, 19 Rothschild Boulevard, Tel Aviv.

U.S. Operation Mission, c/o United States Embassy, 19 Rothschild Boulevard, Tel Aviv.

U.S. Consulate, Mahmillah Road, Jerusalem.

U.S. Consulate, 24 Persian Street, Haifa.

The particulars might also be worth sending to the Latin American missions and to the U.S. Technical Assistance Headquarters, the addresses of which are:

United Nations Technical Assistance Board Headquarters, 6 Even Ezra Street, Jerusalem.

Legation of Brazil, 27 Hagilgal Street, Ramat Gan.

Legation of Chile, 6 Ahuzat Bayit Street, Tel Aviv.

Legation of Cuba, Rambam Street, Tel Aviv.

Legation of Guatemala, 2 Balfour Street, Jerusalem.

Legation of Mexico, 53 Gordon Street, Tel Aviv.

Legation of Uruguay, 10 Rambam Street, Jerusalem.

U.S.A.: Baler Twine

Gwin, White and Prince Inc., P.O. Box 1835, Seattle, want to represent a U.K. manufacturer of baler twine. Established in 1923, they are represented in every major area of the U.S.A. through jobbers. Manufacturers interested should write direct giving both f.o.b. and c.i.f. prices in U.S. currency, also copy correspondence to the British Consulate-General, 1805 Exchange Building, Seattle 4, Washington.

Bahrain : Furnishing Fabrics, etc.

Mr. A. Razak Khonji of Mohamed Tayeb Khonji and Sons will be visiting the U.K. shortly and will be seeking agencies for all types of furnishing fabrics and curtain materials. They are an old established business and have recently opened additional premises. An extensive trade is conducted with local commercial and official concerns, in addition to a thriving trade with Eastern Saudi Arabia. Manufacturers interested in this agency enquiry should write to Mr. A. Razak Khonji, c/o Room 746, Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1.

Bermuda: Hotel Furnishings

A 200 double-room luxury hotel is to be constructed on the south east coast of Bermuda and the project is being undertaken by the Somerset Hotel Co. Ltd., Hamilton, Bermuda, and the architect is Mr. W. Tabler, 401 7th Avenue, New York, U.S.A. It is suggested that U.K. manufacturers of furnishings, etc., interested in offering their products should write direct to the architect, also notify the U.K. Trade Commissioner, P.O. Box 393, Barclays Bank Building, Kingston, Jamaica.

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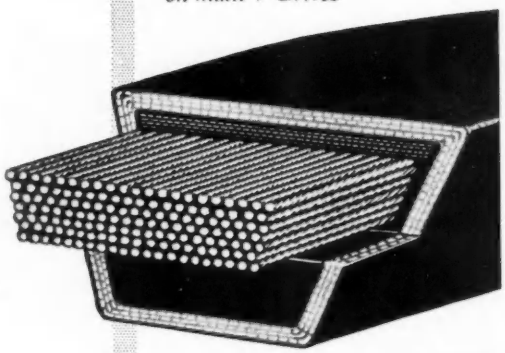

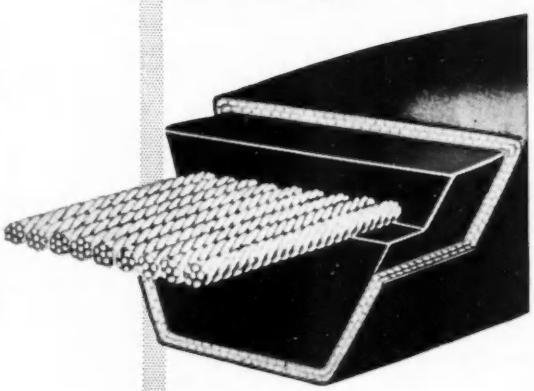

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Textile Trade and Prospects

Cotton Trade Problems

Cotton yarn and cloth markets show little prospects of improvement and the total volume of business is still at the same extremely low levels of the past four or five months. Failure of the discussions with representatives of the Indian and Pakistan millowners on the questions of the steadily rising imports of yarns and cloth into the U.K. has had an additionally depressing effect. Many incline to the view that no solution will be mutually arrived at and what results, if any, will emerge if this problem and the general situation in Lancashire is debated in the House of Commons remains conjecture providing little comfort to managements harassed to the utmost by the present state of trade. Reports continue to circulate that more spinning and doubling mills and some other weaving sheds are considering the advisability of closing down. With some, the prospects of shutting down with the reserves in hand and the sales of plant and machinery, seems a much more attractive proposition to shareholders, etc., rather than to continue this depressing business of trying to obtain sufficient orders in face of the fearful difficulties afflicting the industry.

In yarns, buyers are reluctant to operate and what little business is carried through is for small lots with early delivery the main consideration. Booking ahead is practically non-existent and the general situation in American type cottons does not inspire spinners to operate with any degree of freedom. Total yarn sales have been very small although inquiries have covered a wide range of counts and qualities in single and folded types. Medium count weaving qualities have been mainly in request among the limited sales and coarse ring yarns have been in slightly better request. Fine, mule spun doubling wefts and hosiery yarns have been very poorly supported and, again, the nasty business of complaints as an excuse for cancellations is increasing to an alarming extent. Novelty yarns, i.e., fancy and blended types find ready outlets but the volume is only small. Lower prices do little to stimulate sales and the margins on some yarns are cut to the lowest possible but with very little effect.

The turnover in cloths is no better and substantial orders of any kind are, for all practical purposes, events of the past. Order books are in a very poor state generally. Dress goods in woven and printed styles are only moving slowly and in many cases orders could be attended to at once from stocks. Short-time working is increasing slowly and with it a feeling of complete frustration and apathy on the part of both managements and operatives. Furnishing fabrics are in slightly better request but the off-take here is also far below present productive capacity. Although the situation is a long way from being as bad as the awful 1930 period, the position is definitely worse than the recession of 1955. Sales of household textiles are disappointing with many merchants and wholesalers even hesitating to place routine replacement orders. Industrial cloths have been in modest request but export business is still deplorable. A few small orders have gone through for certain Dominion and Continental markets but imports into this country continue unchecked.

Wool Sales and U.K. Consumption

The tone of the market was rather better than had been expected at the first London wool sale of the May series. Demand was good, most buying coming from the home trade but with good Continental support.

Length was the governing factor in competition for Australian greasy merinos. Long wools sold steadily and were barely 5% cheaper than at the end of March. Those of average length were 7½% cheaper and shorter wools nearly 10% down. New Zealand greasy crossbreds were in fairly good supply, the majority of clips comprising good or average style wools from Auckland and Wellington. The catalogue also included a few Invercargill and Dunedin clips of good style which attracted much the best competition. The New Zealand Wool Commission was called upon occasionally to support the Auckland and Wellington clips, but for the most part the trade was prepared to advance above the Commission's bids. The fall in wool prices was checked at the final Wanganui sale of the season in New Zealand. Rates for average to good styles were slightly higher than at the last South Island sales.

According to the Wool Industry Bureau of Statistics, the rate of wool consumption in the U.K. during March was almost the same as in February but 10% lower than a year ago. Consumption for topmaking was 11% below March last year and woollen trade consumption 9% lower. The wool and hair content in tops produced was at about the same rate as in February but more than 12% below a year earlier. The merino content was 6% lower than in February but the crossbred content was 12% higher. The rate at which tops were drawn was 16% below March last year, and worsted yarn deliveries were also 16% down. The rate of delivery in woven wool fabrics was 6% lower than February and 13% below a year earlier, while the blanket delivery rate was 16% lower than in March 1957. Output figures for March were: wool consumption, 39·36 mill. lb. (clean); top production, 25·88 mill. lb.; tops drawn, 17·22 mill. lb.; worsted yarns delivered, 17·78 mill. lb.; woven wool fabrics delivered, 30·41 mill. sq. yds.; blankets delivered, 1·94 mill. sq. yds.

Figures from Bradford Conditioning House, regarded as a guide to activity in the wool textile trade, show that turnover was well maintained during the first four months of this year. The total weight of material handled, nearly all wool, was 38 mill. lb., only 2·6 mill. lb. less than for the corresponding period last year, when the Conditioning House was operating at a record level. The quantity of wool tops handled in April was larger than in April 1957 or 1956, amounting to 7,057,000 lb. The monthly total for all types of material was 9,644,000 lb., compared with 9,845,000 lb. in April last year.

Linen Trade Review

A gradual improvement in the volume of enquiries from home and overseas in recent weeks has resulted in a fair amount of business being booked. Buying for immediate cover is evident in all sections and seems to have become established practice with spinners and weavers organising production accordingly. While this does not permit most economic working it has stimulated research towards reducing to a minimum time lost in changing and putting through small runs. It has also led to a greater measure of standardisation particularly in spinning.

While the introduction of novelty lines in household linens provides a fillip to demand it is usually short lived and a sudden switch in consumer interest sometimes leaves manufacturers with stocks which can only be cleared at less than cost. For this reason producers and merchants welcome a renewed interest in traditional lines and styles, as evidenced at present in damask table linen and in the handkerchief trade. While these lines have, in recent years, been susceptible to increasing competition from cotton and man-made fibre goods there is little doubt that on a more competitive price basis they could more than hold their own.

The problem of bringing the selling price of linen into line with competitors offers no easy solution and is mainly the concern of the technician. While flax does not lend itself readily to short-cut processing, established practice provides many opportunities for trimming production cost without detriment to quality. Maximum benefit from re-equipment is not obtained by merely substituting modern machines for older models. Replacement must be part of a complete scheme which will include improved layout, standardisation of production with the use of a minimum number of varieties of raw material—flax or yarn.

The supplement to the 1957 "Review of the Linen Industry," by the N. Ireland Ministry of Commerce records a progressive decline in the value of N. Ireland type linen goods exported during the last four years. The breakdown analysis shows this to be mainly due to a drop in the export value of linen piece goods. Demand for made-up goods, including finished linen thread, has been fairly well maintained, and a notable feature has been the sharp increase in value of flax and tow yarns—approximately 30% for the former and

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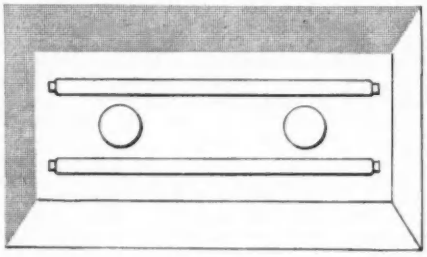

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40% for the latter—exported during 1957, due mainly to increased takings by West European countries and the U.S.A.

While the weaving section is venturing more into the processing of man-made fibre yarns, either alone or in combination with cotton, the spinning end has made little further progress in the man-made fibre field. Even with standard flax processing machinery the possibilities are considerable, and while credit is due for efforts made to expand the export market for linen yarn the need to ensure full utilisation of equipment demands more strenuous efforts to expand production of man-made fibre yarns.

Excess production capacity in all sections constitutes a drag to economic working and few executives have had the courage to trim their sails to the trade winds. During the five-year period preceding 1939 the linen industry's productive capacity exceeded demand for its products by approximately 30%. The reduction in spindles and looms since then has failed to keep pace with the decline in demand, and the problem of excess capacity still remains to be solved, preferably by expanding production, otherwise by mutual agreement or by cut-throat competition.

Linen has no monopoly of any textile market. Consumer interest centres on serviceability and value for money, and consumer appraisal of value is one of the most stable factors in trading today. It is futile to state—as has recently been done by responsible individuals in the industry—that the consumer must be prepared to pay economic prices to prevent firms operating at a loss. He, or she, has an alternative in the range of competitive goods now available. Little interest is being evidenced in raw material as spinners generally have sufficient cover to carry over until a better selection is available. Reports on the growing crop are favourable but details are not yet to hand of the area sown. Processors are experiencing difficulty in reconciling straw prices with current raw material values, and it is evident that, while firm resistance will be offered to any increase in the latter, there is little prospect of an appreciable reduction in the near future.

Man-Made Fibres and Fabrics

Activity in all sections has been somewhat patchy without any immediate signs of improvement in fibre production and in manufacturing or distributing circles. Lancashire manufacturers are finding new orders very difficult to obtain in practically all types and qualities of fabrics although blended cloths and imaginative designs are striving hard to stimulate interest in both furnishing fabrics and apparel cloths. Spun rayon dress fabrics in novelty woven and printed designs are moving slowly and in nothing like the volume usually observed at this time of the year. Spinners continue to experiment and slowly widen the range of blended yarns available. It is no easy task these days to either process some of the mixtures or to find those people sufficiently interested to order in quantities that justify the work involved on the older types of machinery in place in many mills. More short-time working is announced throughout the various districts and the drift of labour coupled to the general state of apathy has reached distinctly alarming proportions.

Up to now, activity in the Yorkshire trade has been quite good but even here the slackening in tempo is noticeable in both the worsted and woollen sections. All worsted, worsted/nylon and worsted/"Terylene" suitings find reasonable support but interest in certain types of coating, etc. cloths is not what it was. Spinners of hosiery yarns report a steady off-take in spun nylon qualities with similar support for nylon/wool and wool/"Terylene" varieties. Hand knitting yarns—all wool and blended—are available in new shades and effects.

In the Leek area trade is much less than it was. Following a slightly better tone immediately after the Budget, business has now subsided to day-by-day ordering of small quantities with very few signs of improvement in the near future. Only in a few specialities can the turnover be regarded as satisfactory and in these cases also there is considerable room for improvement judged by a comparison of capacity with output. In general, the position is only moderate regarding most smallwares but there has been a slight improvement in scarf, etc. production.

Macclesfield screen printers are by no means happy with the prevailing position in that lack of orders has led to a measure of short-time working and a similar state exists in machine printing. The interest in ties and one or two other speciality woven cloths is reasonable but orders of a repeat nature are by no means great and long runs virtually absent.

Trade in the Midlands is undoubtedly feeling the effects of competition in knitted outerwear garments, particularly from Italy and France. Imported Empire made knitted products also continue to hamper trading activities of many firms but novelty and styling, especially in ribbed styles, is helping to combat the doubtful attractions of lower prices of imported goods. Order books are certainly less bulky these days, and in the ladies' section of the trade, business is confined to repeat ordering of small quantities. Fully-fashioned hose continues to sell well and a growing demand is reported for finer crepe styles.

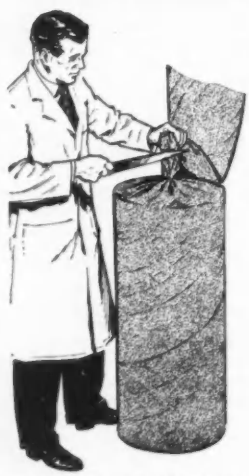
Jute Fibre, Yarn and Cloth

Raw jute markets have remained firm with no signs of prices falling to the level ruling earlier in the year. It is unlikely Pakistan will allow prices to drop being in urgent need of foreign currency to carry out developments. There will be sufficient raw jute to meet all requirements until the next crop, but the bulk of the fibre available is lower grade. Offers of higher qualities have been scarce and there is nothing to indicate shippers are holding quantities of better type fibre. One or two offers of new crop were made during April but no bulk offers have been made so far. Last year at this time offers of new crop were freely made with prices quoted £10 per ton below the level of old crop fibre. This year the position is different with shippers making no offers. This restriction by Pakistan against selling forward may possibly maintain prices at a higher level than usual.

Spinners in Dundee have shown interest in raw materials and the business taking place has been about equal to their cut-up. This type of buying may continue for the remainder of the season as U.K. stocks are not large. Offers of Mill Firsts are scarce and prices quoted irregular. Although some sellers are naming £115 10s., others asking as much as £120. Mill Lightnings are freely available at £102, Mill Hearts at £91 and grade Hearts at £74, c.i.f. U.K., May/June shipment. During the past few weeks white jute has been more freely offered than dark. This may be accounted for by the fact that new crop white jute should be offered freely within the next month and holders of old crop stocks are anxious to reduce holdings. Grade Tossa-2/3 is available at £116 and Tossa-4 at £107 but offers of the latter are not freely made. Outport Tossa-2/3 is £102 and Outport Tossa-4 £84 10s. Crack Daisee-2/3 is £106 with grade Daisee-2/3 available at £98 10s., c.i.f. U.K., May/June. Since Pakistan ruled that all offers of raw jute had to be made direct and not via Calcutta, the position in Dundee has been difficult. The trouble is the delay in cables being received from east Pakistan. Although complaints have been repeatedly made, it appears to be outside the power of the U.K. to make any improvements in these communications.

The Calcutta goods market became easier in May due to the Argentine government withdrawing import licences. Prices of hessians and heavy goods had their biggest fall since the Indian jute mills agreed to minimum prices about two months ago. There was at least one steamer loaded in Calcutta with gunnies which had to be discharged at that port due to the withdrawal of import licences. However, the market recovered fairly quickly but did not return to quite the same level. Stocks of goods held by the Indian mills at the end of April was 4,000 tons lower for hessians but 5,000 tons higher for sackings compared with the position at the end of the previous month. However, the position at the end of May might show a different outlook due to the lack of exports to Argentina. At the end of April the Calcutta goods market was firm with prices advancing due to the Indian government having been in the market for approximately 22,000 bales of sackings. Egypt was also buying and the quantity placed was reported to be 15,000 bales for May/June shipment.

By the middle of May prices of Calcutta goods had steadied somewhat with quotations at 61s. 5d. for 10 oz. 40 in., and at 46s. 3d. for 7½ oz. with 11 oz. 45 in. at 68s. per 100 yds. f.o.b. Calcutta for May shipment; B twills were quoted at 154s. 9d. May. U.K. buyers have shown only a small interest, mainly in hessians. Prior to yarn and cloth prices being raised in the U.K. during April a fair amount of business was placed but since then the position has become quiet with buyers confining purchases to immediate needs. The main feature in the yarn end has been the steady offtake by the carpet trade. Spinners of this type of yarn are well supplied with orders for a few months ahead. The linoleum industry has also been a steady customer. The same cannot be said about ordinary weaving qualities which have been quiet for some time now. Demand for cloth has been small and mainly for early delivery. Output has had to be reduced in some instances owing to the quietness. Producers of the heavier types of cloth have been the worst hit and the outlook at present is far from bright.



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Notes and News

New Method of Rubber Lining Canvas Hose

A new process in the manufacture of lightweight rubber latex lined flax canvas hose for fire fighting and other purposes has been introduced by Richards Ltd., flax spinners and manufacturers, Broadford Works, Aberdeen. The process, which is part of a £750,000 development scheme, incorporates several unusual features including the use of an obsolete ventilating chimney, 120 ft. high, inside which jackets for lining are suspended. More than 6,000 ft. of fire fighting hose can be treated in this tower at one time, so that productivity is increased compared with other methods employed.

This patent method of rubber latex lining introduced from Switzerland has been successfully used over the past ten years. During the last year Richards Ltd. have been installing this rubber latex lining plant and for the last few months have reached the stage of full production. The lined hose gives great flexibility in use and is extremely easy to handle, whilst it has very low water absorption on the outside due to the rubber impregnation of the yarn, and drying is easy and rapid. The hose is also bonded at low temperature which avoids damage to the canvas jacket during the lining process. It has high resistance to abrasion and is impregnated against mildew. Prices compare favourably with similar products. The jacket of the hose is made of best quality flax, flax line warp and flax line weft, with an alternative made with flax line warp and "Terylene" weft.

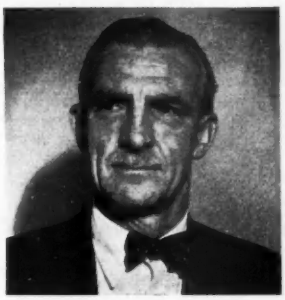
In preparation for its introduction into the tower, the hose, after being cut into the required lengths, is placed on long benches and special couplings are attached to each end of each length. Then by means of fittings on the elevator the lengths are pulled up and the hose is then ready for lining by pumping the rubber latex into the jackets. The actual process of lining is repeated several times, depending on the thickness of lining required. On completion of the lining, drying is then carried out by means of two oil-fired air heaters, which circulate hot air throughout the tower, and is done in such a way as to ensure maximum use of the heat by the circulating fans. Each impregnation and drying requires about two hours. As can be appreciated, this method of lining hose is entirely different from that normally employed in this country and a special feature is that operatives in the elevator around which the hose is suspended, can examine and test the hose before removal from the tower.

Russian Delegation Visits Lancashire

The Russian textile delegation which visited Lancashire during May to collect facts about conditions in the British textile industry, went to the Imperial Mill of John Spencer (Burnley) Ltd., at Rosgrove, Burnley, Lancs, to see one of Lancashire's best mills fully equipped with automatic looms and running three shifts. The picture shows the delegates watching a Sulzer loom producing cotton poplin at high speed (l. to r.) Mr. J. H. Spencer (managing director, John Spencer (Burnley) Ltd.); Mr. H. Hudson (president, Burnley Weavers' Association); Mr. T. Spencer (chairman, John Spencer (Burnley) Ltd.); Mrs. V. Federova (weaver at the Three Hills mill in Moscow); Mrs. A. Novikova (chairman of delegation, and secretary of Textile Workers' Union, U.S.S.R.); Mr. H. Dickinson (secretary, Burnley Weavers' Association); Mr. Alexey Borodin (State Research Institute, Moscow); and Mr. A. Botvinov (interpreter).

S.D.C. PRESIDENT

THE new president of the Society of Dyers and Colourists is Mr. J. Boulton, M.Sc.(Tech.,) F.R.I.C., F.T.I., F.S.D.C. (manager, Research Laboratories, Courtaulds Ltd., Droylsden, Manchester). He joined the company as a member of the staff of the Textile Division's research laboratories at Bocking and began research into the then new field



Mr. J. Boulton, M.Sc.(Tech.,) F.R.I.C., F.T.I., F.S.D.C.

of physico-chemical principles of dyeing, subsequently publishing a series of papers which culminated in the award in 1943 of the gold medal of the Worshipful Company of Dyers.

For many years, Mr. Boulton has played an active part in the affairs of the S.D.C., and was chairman of the Manchester Section in 1955-57. He has served on many committees, including the Fastness Tests and Co-ordinating committee, and was chairman of the Light Fastness subcommittee. Until recently Mr. Boulton was honorary secretary of the Textile Institute.

Departmental Changes in Cotton Board

The Cotton Board has introduced changes in the allocation of functions to its departments. Activities relating to the sales promotion campaign in the home market are being undertaken by the Home Trade Department. The former Industry Relations Department has ceased to exist and its recruitment and training activities transferred to the Productivity Centre. Head office of the Board continues to be at Royal Exchange, Manchester 2, where the administrative headquarters (Director General—J. Broatch, Secretaries—H. E. Wadsworth and S. Wilks, Public Relations Officer—A. Humberston), Finance Department (Director—G. W. Killick) and Overseas Trade Department (Director—T. D. F. Powell) are located.

Other departments are: Colour Design

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of leakage

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and Style Centre, 19 York Street, Manchester 2 (Director—D. H. Tomlinson); Productivity Centre, Fielden House, Mersey Road, Manchester 20 (Director—J. Bolton); Statistical Department, 3 Alberton Street, Manchester 3 (Director—D. C. Shaw); Home Trade Department, 3 Alberton Street, Manchester 3 (Director—F. Sugden).

Wool Top Prices

Bradford wool top prices in April reached their lowest point since November 1949. The "Weekly Wool Chart" index number for prices of tops in April was 351, compared with 357 in March and 480 a year ago. The index number for April was one point lower than in March 1952, and compared with 333 in November 1949. The separate index number for merino tops was 337, compared with 341 in March and 462 a year ago. The index number for crossbred tops was 365, 357 in March and 498 a year ago. The index numbers are monthly averages based on July 1914.

New Fashion Colours in "Seraceta-Duracol" Range

Iced Lemon C563, Spectrum Green D538, Violetta C707, Pink Bengale C493 and French Blue B698 are five new colours included in the "Seraceta-Duracol" range for 1959. The range of over 50 different colours covers a wide variety of standard and speciality yarns. "Seraceta-Duracol," with its high fastness and excellent appearance is particularly suitable for swimwear, evening and day dress wear, umbrellas and ties, etc. The yarns are available in 100, 140, 200 and 300 den. but British Celanese Ltd. will consider other deniers on request. They are also available flat, or with voile twist and in all processed forms such as cheese, cone, pirn, beam, etc. Warps can be supplied plain or patterned, and sized for ordinary and loom finish. Specially sized warps for spot-resist finish for dresses, and water-proof finish for umbrellas are also available. Many of the well-known "Seraceta" speciality yarns such as slub, ribbonstraw, marlspun, and "Seracour" (textured) are also available in "Seraceta-Duracol" colours.

Nylon Sheathing for Boats

In a new sheathing process for wooden boats developed by Leicester, Lovell and Co. Ltd., Southampton, the nylon fabric is glued to the bare wood of the boat with a special resorcinol resin glue which ensures a first class bond and is subsequently painted over with a special vinyl resin finish. The process can be used not only to make leaky boats watertight but also provide a protective sheathing. Nylon is used because it has tremendous strength and abrasion resistance. Its flexibility enables it to be stretched to the shape of the hull and ensures that it flexes with the wood. For boats of up to 25 ft. in length a 4-oz. nylon fabric is used; those over 25 ft. require a 12½-oz. fabric.

Boats sheathed by the "Cascover" process range in size up to a 45 ft. naval launch and some have been in service for periods of up to three years. The new process is claimed to provide a very high degree of protection for boats used in tropical waters. The Tropical Testing Establishment of the Ministry of Supply report: "Sheathing with either of two weights of nylon fabric, with or without vinyl resin finish, has protected African mahogany panels against shipworm (Teredo) attack for 22 weeks in raft trials at Port Harcourt, Nigeria. Unprotected panels were completely destroyed in this time. The trials continue."

Hycar Latex

Production of a full range of Hycar synthetic rubber latices, based on butadiene/acrylonitrile copolymers, is announced by British Geon Ltd., Devonshire House, Piccadilly, London, W.1. Four grades are available: Hycar 1561 and 1571 which are high acrylonitrile copolymers, and Hycar 1562 and 1577 which have a medium acrylonitrile content. Hycar latices are used in the manufacture of crock reducing and abrasion resistant textile finishes and as binders for non-woven fabrics, etc.

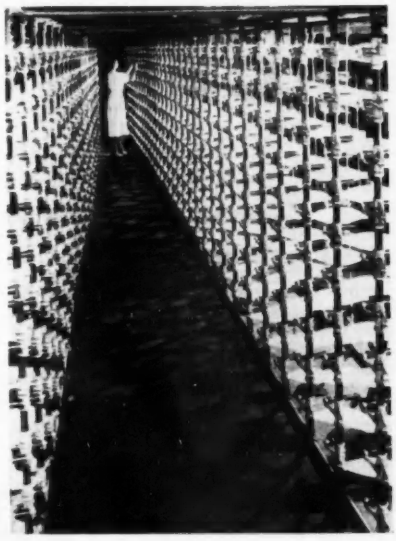
South Africa's Wool Shipments

The U.K. was South Africa's best customer for greasy wool during the period July 1 to March 31; shipments amounted to 34,349,000 lbs. Other leading buyers were France, taking 29,467,000 lbs.; Russia, 23,081,000 lbs.; Germany, 22,226,000 lbs.; Italy, 18,250 lbs.; U.S., 12,886,000 lbs. and Belgium 7,723,000 lbs.

Uses of Hydrogen Peroxide in Textiles

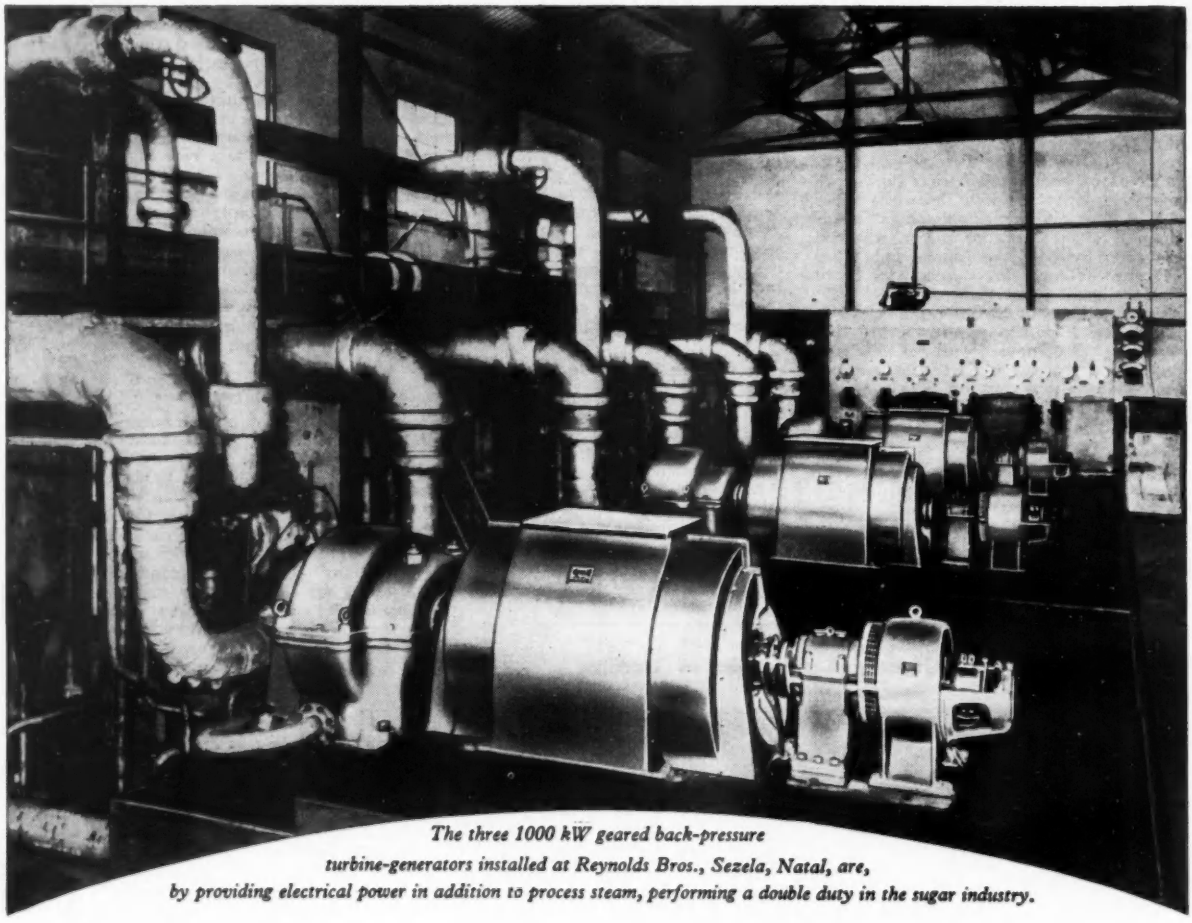
A corner of the exhibition recently held by Laporte Chemicals Ltd.; (l. to r.) Mr. J. L. Harris (Standfast Dyers and Printers) and Mr. A. W. Harrison (Wool Industries Research Assn.)

THE recent exhibition in Manchester by Laporte Chemicals Ltd., demonstrating the use of hydrogen peroxide in the textile industry revealed a variety of uses which must have surprised some of the visitors, for the uses even included the development of this chemical as a fuel for a jet engine. Probably the most interesting display in one which included practically all aspects of the textile industry, was that devoted to the work of the Wool Industries' Research Association. The new shrink-resist process, developed at Torridon, is one which will not affect the handle of the wool. It is a process which can be given before dyeing, so that level dyeing results, and it also enables a high degree of unshrinkability to be attained. It is claimed that this process, based on the treatment of wool goods in a mixed bath containing peracetic acid and sodium hypochlorite meets the condition for, in addition, to giving a good degree of unfeltability, the handle and weight of the wool remain substantially unchanged. A wide range of dyeings indicated little or no change in the colour. For knitted goods, it is claimed that if knitted properly, a completely unshrinkable garment is obtained by the new process.



An intriguing pattern created by the light passing between nylon yarn packages in a large magazine creel at the Pontypool factory of British Nylon Spinners Ltd. The creel is by Crowther Ltd., Leicester

Geared Back-Pressure Turbines–



The three 1000 kW geared back-pressure turbine-generators installed at Reynolds Bros., Sezela, Natal, are, by providing electrical power in addition to process steam, performing a double duty in the sugar industry.

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Great advantages can be gained by installing small back-pressure turbines for heating and process steam requirements in large factories. The back-pressure turbine is relatively cheap to install, occupies little space and requires only light foundations.

When Metropolitan-Vickers first installed one of their own back-pressure turbines at their Trafford Park Works in 1948 the cost of power and heating requirements for the factory were reduced by over £9,000 a year.

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RECENT TEXTILE PATENTS

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776,526 Doffing on Variable Speed Ring Frame

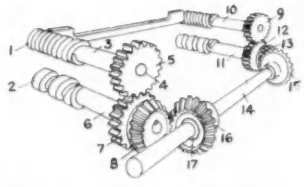
W. BREMATEX, 66 *Boulevard Antée, Tangiers.*

A spinning frame provided with variable speed driving, has means for controlling the ring rail in such manner that it reaches an end position at the end of the sett. Means are arranged so that, when the ring rail reaches this end position, the speed at which the frame is driven is automatically reduced from its normal running value to a given lower value suitable for the subsequent doffing of the finished cops.

777,126 Setting of Faller Screws on Roving Frames

FAIRBURN LAWSON COMBE BARBOUR LTD., *Wellington Foundry, Leeds* 1.

Describes roving or spinning machines having screw-operated pin faller heads with means for facilitating easy and accurate assembly and adjustment of the faller screws. The screw mechanism for a faller head comprises a top screw 1, cooperating with a bottom screw 2, the bottom screw having a larger pitch than the top one so as to return the faller bars to the back of the head as rapidly as possible. The top screw is formed on a shaft 3 which has splines 4, the number of splines being 1 more or 1 less than the number of teeth on the wheel 5 which is placed on the splines. The screw 2 is formed on a shaft 6, this shaft carrying a wheel 7 and a bevel wheel 8, both these two being keyed firmly to the shaft 6. A pinion 9 is provided for the top shaft 10 on the opposite side of the head, and the bottom shaft 11 has a pinion 12 and bevel

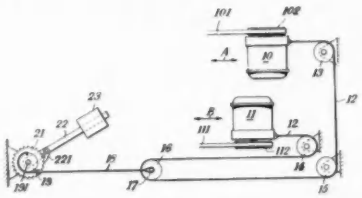


13. The two bevels 8 and 13 are driven from a shaft 14 by means of further bevels 15 and 16, the latter being provided with a set of vernier splines 17. During assembly, the shaft 6 with its screw and pinion is laid in bearings on the frame of the faller head, and the shaft 3 with its screw is placed in bearings above the bearings for the bottom shaft. The two screws are then set correctly relative to each other by gauges, and the pinion 5 is located on the splines 4 by trial so as to mesh accurately with pinion 7. A similar process is carried out in connection with the shafts 10 and 11. Finally, the shaft 14 with its pinion 15 is placed in position on the frame so as to mesh with the pinion 13. At this time, the pinion 16 is slid along its splines away from pinion 8 so as not to mesh with it. The pinion 16 is now positioned on the splines so that it meshes correctly with pinion 8 and is then locked in position.

777,360 Drive for Two Tier Spinning, Doubling and Winding Machines

T.M.M. (RESEARCH) LTD., *Hartford Works, Oldham.*

Spinning, doubling or winding machines in which the spindles are arranged in tiers at different heights, with improved means by which the endless belts transmitting driving motion to the groups of spindles may be maintained constantly at the same tension. The apparatus comprises two independent electric motors



10, 11, which drive the spindles of different tiers through belts 101, 111, passed around the pulleys 102, 112, the motors being capable of movement in the direction in which tension is exerted in the driving belts, as indicated by the arrows A, B. Each motor is attached to one end of a flexible element 12, which passes about guide pulleys 13, 14 and 15 and the sheave 16 of a single pulley-block, to the axle 17 of which is connected the end of a flexible link 18. The link 18 is wound about a roller 19 mounted on the frame and carrying a ratchet wheel 21. An arm 22, bearing an adjustable counter-weight 23, is freely mounted on the axle 191 of roller 19 and a pawl 221 on arm 22 is arranged to engage the ratchet wheel. Tension in link 18 is transmitted through the sheave 16 to the element 12, applying equal forces to the motors 10 and 11 and thereby an equal tension to each of the driving belts.

777,828 Automatic Pre-Boarding

MELLOR BROMLEY AND CO. LTD., *Minotaur Works, St. Saviour's Road East, Leicester.*

A machine for use in the finishing of hosiery in which the articles, mounted on forms, are subjected to the action of a heated fluid or fluids, in a closed chamber. The machine has two aligned outer trackways extending outwards one from each of two opposite sides of the treating zone, two form-carrying carriages being arranged to run on one of the outer trackways to and from a corresponding inner trackway section which is fixed in the treating zone. The carriages reciprocate between end treating and loading positions along a strictly rectilinear path. Means are provided for enclosing each carriage in turn in the treatment chamber defining, these means being automatically operable in response to the carriage travel. Means are also provided for supplying treating fluid to the interior of the closed chamber automatically in timed relation with the enclosure of the carriage in the chamber.

778,076 Stretching Synthetic Filaments and Yarns

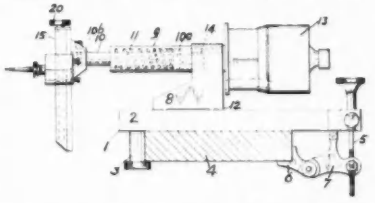
I.C.I. LTD., *London.*

An apparatus for use in the drawing of synthetic yarns and filaments comprises a number of units, each consisting of a feed roll and a draw roll. Each roll is mounted on a separate shaft, and a single main drive actuates all the feed rolls through the separate drive shafts, each individual draw roll being driven from the drive shaft of the corresponding feed roll.

778,202 Gauging Apparatus for Knitting Machines

HOSIERY AND ALLIED TRADES RESEARCH ASSOCIATION, *Thorneywood House, 4 First Avenue, Sherwood Rise, Nottingham.*

An improved dimension gauging apparatus particularly concerned with the building up of straight bar knitting machines. The gauge comprises a clamping section 1 comprising a base 2 with knurl-headed members 3 at one end to locate on one side edge of a gauging bar rail 4 of the machine and having at the other end adjustable means 5 for manipulation of a fork 6 to locate on the other



edge of the bar through a lever 7. On the base is bracket 8 from which there extends a tube 9 which is bored to house a sliding plunger 10 which is retracted into the tube when in normal position by a spring 11. The bracket 8 is insulated from the base by insulation 12. A micrometer head 13 is mounted on the bracket 8 and its spindle 14 is adapted to act on the inner end 10*a* of the plunger 10. To the end 10*b* of the plunger there is a microgauge head 15. The microgauge 15 is suitable for gauging needles, sinkers, dividers, knocking over bits, and picot and fashioning points.

778,235 Treatment of Glass Fibres

M. P. DE VINZELLES, 2 *rue César-Franck, Casablanca, Morocco.*

A method of agglomerating fibres which comprises applying to the fibres a fine spray of polyester resin, which is dissolved in a solvent and contains from 5 to 20% by weight (based on the resin) of poly-

merisation catalyst and up to 40% by volume (based on the resin) of accelerator for the catalyst. Preferably the fibres are glass fibres. In one example, glass fibres cut to suitable length are passed down through a whirling current of air on to a moving fine metal screen. The fibres in falling pass through a hood where they are sprayed with a solution of 1 part by volume of "Beckacite" Flex in 4 parts by volume of trichloroethylene. The polyester resin contains 5 to 20% by weight (based on the resin) of benzoyl peroxide and 5 to 6% by volume of accelerator (a 10% by volume solution of dimethyl aniline in monomeric styrene). The moving band carries the mat to a unit where the mat is dried.

778,313 Improved Loom Temples

LOGAN MUCKELT AND CO. LTD., 14 *St. Peter's Square, Manchester.*

An improved and simplified loom temple and mounting which will enable a loom slay to have a large or increased amplitude of movement whilst maintaining the normal position of the temples relative to the breast beam. The housings for the temple rollers are each adapted to engage directly with one of the end portions of the supporting temple bar, the end portions being cranked down so that the nip of the temple rollers coincides with the plane of the fabric.

778,377 Manufacture of Chenille Carpets

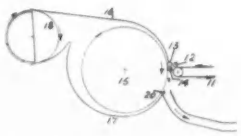
J. TEMPLETON AND CO. LTD., *Templeton Street, Glasgow.*

Manufacture of chenille and to carpets made from it, in which the pile surface is undulating, this effect being obtained by using pile tufts the lengths of which vary. The chenille consists of a series of cut pile tufts and a mid-binder woven through the tufts to bind the tufts together, the tuft ends outlining on opposite sides of the binder a wavy form which is symmetrical with reference to the mid-binder. Mechanism for cutting the chenille into strips comprises two cutters positioned on opposite sides of the chenille mid-binder location. Means are provided for effecting relative longitudinal cutting movement between the chenille cloth and the cutters, and for moving the cutters transversely to and fro on their respective sides of the mid-binder during the longitudinal cutting movement so that each cuts a similar undulating line of cut. Means are also provided for setting such lines of cut opposite to each other whereby the chenille cloth is cut symmetrically on opposite sides of the binder.

778,417 Opening of Cotton Waste

BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION, *Shirley Institute, Didsbury, Manchester.*

Preparation for spinning hard waste comprising spun cotton or other staple fibres. Waste material from a running down machine is fed to a devil of known type and then fed to an improved machine, and finally to another such machine. Each of the latter two machines consists of a feed lattice 11, an assembly of feed rollers 12, 13, 14, a spiked cylinder 15, embraced by two covers 16, 17 and a cage 18. The cover 16 extends from just over the feed roller 13, above the cylinder 15 and then forward up to the upper part of cage 18. This cover is spaced from the cylinder, at the upper part, at a substantial distance conveniently 4 ins.). The cover 17 commences adjacent to the bottom part of the cylinder, that is, some 6 ins. from the



bottom of the feed system, and a deflector plate 19 is disposed between the end of the cover and the feed roller 14, and about 1 in. from the feed roller. The end of the cover lies close to the cylinder periphery and forms a separating edge 20 for the material carried around in the air currents caused by the rotation of the cylinder. The cover curves so as to form a space of gradually increasing depth between itself and the cylinder before extending to the bottom of the cage.

778,471 Backing Fabric Feed for Tufting Machines

M. M. BEASLEY, 313 *West Main Street, Chattanooga* 8, *Tennessee, U.S.A.*

A tufting machine comprises needle mechanism, fore and aft roll for feeding base fabric through the needle mechanism. Drive mechanism for the rolls include a separate train of gears for each roll, each gear train including an input shaft, means for driving one of the input shafts in timed relation to the needle mechanism, and means for driving the other input shaft from the one input shaft. The said last-mentioned includes means for driving the aft roll at a slightly higher rate of speed than the fore roll to tension the base fabric in the line of feed and between the feed rolls.

778,637 Ring Frame Balloon Limiters

BREMATEX, 66 *Boulevard Antée, Tangiers.*

On a ring frame the ring rail is arranged to have, beyond the end of its normal movement a supplementary movement, for the formation on the base of the cop, of yarn which is partly unwound when the cop is removed from the spindle. Every spindle is surrounded by a balloon limiter carried by the ring rail through a retractable support. The limiter, normally held at a distance from the ring rail during normal movement, is retracted to a position very close to the rail, so as to clear the space surrounding the cop, in response to the production of the supplementary underwinding stroke of the ring rail so as to perform retraction of the balloon limiter during the underwinding stroke.

778,731 Improved Opening Machinery

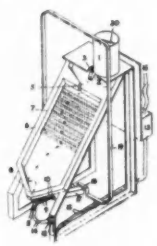
T.M.M. (RESEARCH) LTD., *Hartford Works, Oldham.*

An improved form of opening machine comprises a feed conveyor upon which the material may be spread and which delivers the material in the form of a fleece to a co-operating pair of feed rollers which forward the fleece at a controlled rate to a dual conveyor system. This system comprises two spiked lattices arranged side by side and driven so that adjacent courses travel in the same direction at different speeds, the differential speed performing a combing and opening action upon material. Apparatus is provided for receiving the material at the common discharge point of the conveyors and removing it for further treatment.

778,733 Control for Random Effects

KIRKLEES LTD., *Bury.*

Apparatus for generating randomly occurring impulses which can be employed to operate or control apparatus where randomly occurring effects are desired. one application being in the production of random slub yarns. A pin table is formed with horizontal rows of pins 7, the pins in one row being staggered in relation to those in adjacent rows. The entry to the pin table is in the form of a vertical slot 5 to which balls are fed singly from a rotating wheel 2 to which they are fed from a storage drum 1. The wheel has compartments 3 each of which receives a ball from the drum as the wheel rotates and delivers it to the entry 5. Each time the wheel rotates, as many balls are delivered to the pin table as there are compartments in the wheel. The pin table is inclined at a suitable angle and at the bottom the sides are inclined to direct the balls to an outlet hole 8 through which they fall on to insulated parts 9 of a pair of "live" rails 10. The rails are connected at 11 through wires 14 to a terminal block 12 which in turn is connected by wires 15 to a relay 13, the output wires of which are at 16. When a ball falls it bridges the

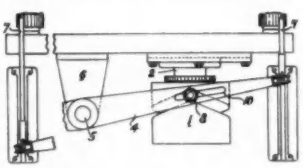


rails and completes the electric circuit to relay 13 and as the rails are inclined, the balls will roll down them and the circuit to the relay will be maintained until the ball rolls off their ends. The portions 9 of the rails on to which the balls fall direct the balls on to the live parts 10. The balls roll from the ends of the rails 10 to a chute 17 which delivers them to a hopper 18 from which they are fed to an endless chain conveyor 19 which carries them up to a chute 20 at the top of the storage drum.

778,783 Improved Winding Frame

DOUGLAS FRASER AND SONS LTD., *Westburn Foundry, Arbroath, Angus, Scotland.*

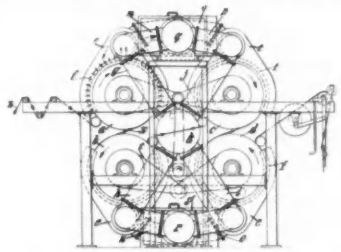
Describes a more reliable way of altering the positions of the rocking lever and the cam follower relatively to the frame on winding frames. 1 denotes a cam mounted on an axle 2, 4 denotes a rocking lever pivoted at 5 to a fixed part 6 of the frame and carrying at least one thread guide 7.



8 denotes a cam follower carried by the lever 4 and engaged with the cam. During operation of the machine, the axis of the pivot 5 maintained in a vertical plane at right angles to the vertical plane containing the axis of the cam and bisects the throw of the cam so that the axis of the cam follower when prolonged, intersects the axis of the cam at the point of reversal of the throw of the cam.

779,093 Cloth Drying Machines
SIR JAMES FARMER NORTON AND CO. LTD., *Adelphi Ironworks, Adelphi Street, Salford* 2.

Describes a cloth drying machine, having a greatly increased output as compared with the usual cylinder type drying machines. In one form of the improved drying machine, there are four drums, *a*, *b*, *c*, *d* around which the cloth *x* passes in series. Around a part of each drum is a casing *e* which has within it a part cylindrical partition wall *f* with apertures so that hot air supplied to the casing by a hot air pipe is caused to impinge on the fabric as it passes around the drum. The drums are preferably steam heated



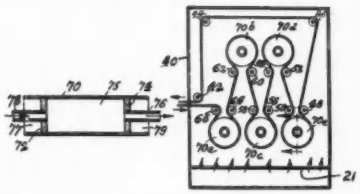
cylinders. The exhaustion of hot air from the casing around each drying drum is from a mid-position with hot air nozzles at its opposite sides. There are 4 exhaust pipes *g*, *h*, *i* and *j* leading to a central common exhaust pipe *k*. Four branch exhaust ducts *m*, *n*, *o* and *p* lead to two pipes *q* and *r* and these ducts deliver part of the exhausted hot air through a fan and filter to air heaters *s* and s^1 which also receive air from the main air inlets at the opposite side of the machine. Thus part of the exhausted hot air is re-circulated through the casings *e* and the apertures in the partition *f* around each drying drum.

779,107 Lock Knot
DOMINION TEXTILE CO. LTD., 1950 *Sherbrooke Street West, Montreal, Quebec, Canada.*

A knot for connecting lengths of flexible cord in a net comprises a first spiral loop in one of the lengths with portions of the length continuing from the loop in opposite directions. In the other length an undulating formation has three consecutive bights of which any two adjacent bights extend in opposite directions and passing through the first loop, over a portion of the loop and one of the length portions extending away from the loop, back through the loop around the length forming the loop and again passing through the loop, around a portion of the length forming the loop and the other of the lengths extending away from the loop. Finally it is passed back through the loop in a direction opposed to the first entry into the loop.

779,149 Improved Steaming Apparatus
R. P. HIGGINBOTTOM, 6659 *Sherbrooke Street West, Montreal, Quebec, Canada.*

Improved apparatus for steaming or treating vat colour prints, dyes, discharge prints, etc., by chemical reduction methods. A processing chamber 40 has heat exchange units of the cylindrical rotary type. In the construction there are five such units indicated at 70*a* to 70*e* mounted in spaced relationship with the guiding rollers 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66 so that the material in part is guided by the rollers and in part by the units 70*a* to 70*e*. This brings the outer peripheral surfaces of each of the cooling units into rolling contact with the material as it is being processed so that the moisture formed products of condensation are brought into reactive contact with the material during the heat generating chemical reactions. Steam is introduced through a perforated bottom plate 21 mounted within the chamber. The heat exchange unit has a



cylindrical body 70 partitioned transaxially by spaced partitions 72, 74 positioned adjacent each end. The fluid conduit members comprise hollow shafts 76, 78 by means of which the unit is mounted for rotation. In operation, fluid of a lower temperature than that of the steam filling the processing chamber is supplied to the centre portion 75 of the unit. The outer ends 77, 79 are open to the atmosphere of the enclosure so that in effect three zones of varying temperature are created. The ends 77, 79 reach a temperature the same as the atmosphere of the chamber, the centre portion 75 is cooled by the fluid passing through to a temperature below the atmosphere of the enclosure and the portions of the unit intervening the ends and the centre portion, at the partitions, has a temperature between the temperature of the ends and centre.

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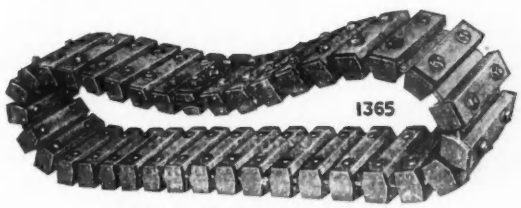

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Belts made specially for other makes of Speed Varier and Expanding Pulley. Jointed or endless. To suit flat driven pulley when required. Please give fullest particulars, sending a specimen belt if at all possible.

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MANUFACTURERS of sectional water storage tanks, 50 to 40,000 gallons capacity. Sewage and Effluent Pumps. G. L. Murphy Limited, Imperial Works, Menston, Nr. Leeds.

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FOR Sale, one Rag Washing Machine, 2 to 2¼ tons capacity per day, complete with motor and starter, in excellent condition. Box TX84, "Textile Manufacturer," 31 King Street West, Manchester 3.

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For Bulk Cutting of all Textiles; Cloth, Fabric Duck, Felt, Canvas, Wool. Wadding Waste, and general making-up trades, etc. Will do the work of six hand cutters.

Straight and Round Knives.

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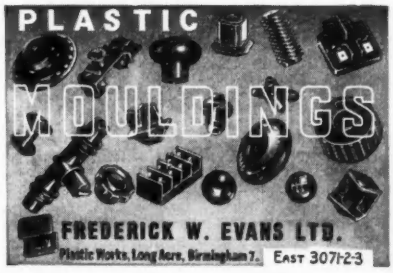

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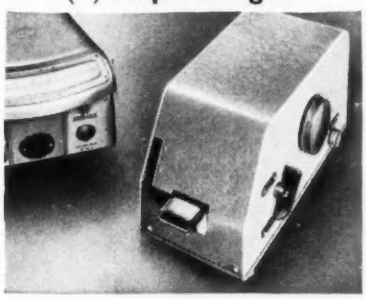

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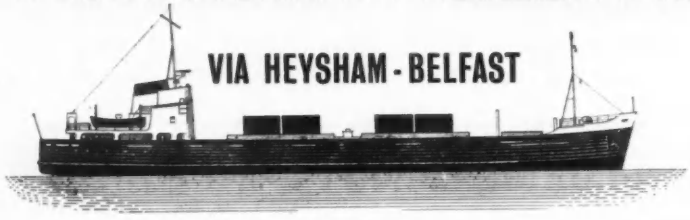

Two new container-carrying ships of unique design offer even better transport facilities to foster the ever increasing flow of trade. M.V. Container Enterprise is now in service; M.V. Container Venturer will follow soon. 18 weekly sailings connect at Heysham with express train services from all parts of Great Britain. Further information from District Marine Manager, Heysham Harbour, Lancs. (Heysham 73); Shipping Traffic Superintendent, 20, Donegall Quay, Belfast (Belfast 28061); Irish Traffic Superintendent, Euston Station, London, N.W.1, or any station of British Railways.

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For over 80 years we have specialised in making Drying Cylinders of all sizes for the Textile and kindred trades.

We shall also be pleased to quote you for Dyeing Machine Linings or for Tanks to suit your requirements.

All new and repaired cylinders are tested to twice the required working pressure before leaving our works.

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SPECIALISTS IN

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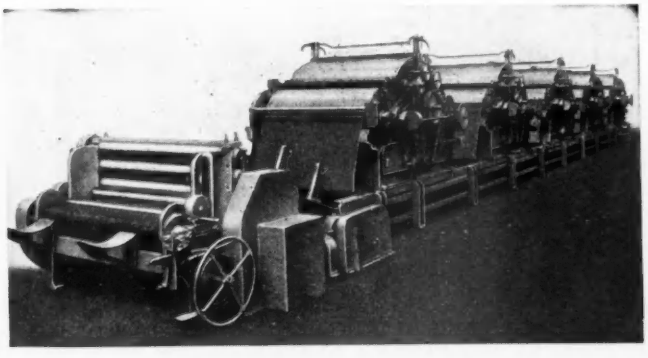
FOR COTTON WASTE and WOOL



Right : Three-card " Continental " Type Set comprising automatic feed, breast single breaker card, centre draw and Scotch feed, single intermediate card, patent parallel fibre feed, single finisher card, and six-tier tape condenser.

Left : Range of three-roller pattern Carding Engines for Absorbent Cotton Wool.

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"For Pete's sake give me a 'brake.'"

The IRVIN HUDSON

STOP on PICK

BRAKE MOTION

will give you:

- No Broken Picks or Starting Places, even by inexperienced weavers.
- One operative can work up to 20 looms at a time.
- Greatly increases production, eliminates waste.
- Cuts out necessity for expensive new automatic looms.

Over 100,000 already in world-wide use

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Switch from this—

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For working within close limits, an Anglepoise is simply indispensable. However good a worker and his eyes may be, he must see the job. This applies in all fine work, drilling, assembling, etc., where instantly adjustable close-to-the-job lighting is a sheer necessity.

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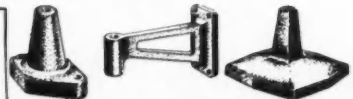
Why not fit your products with Anglepoise? We will submit samples on approval.



Some alternative bases.

Sole Makers: **HERBERT TERRY & SONS LTD · REDDITCH · WORCS**

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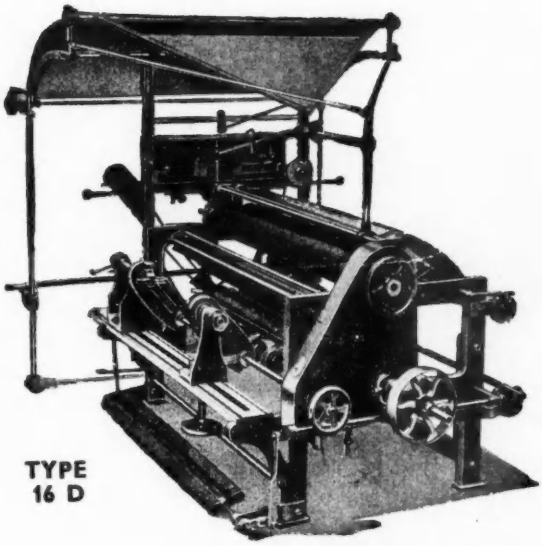

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Textile Machine Makers and Electrical Engineers

A&H SIMONETT
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RIGGING ROLLING & MEASURING MACHINE

- Gives ACCURACY of MEASUREMENT upon all Fabrics, including Stretchable or Non-Stretchable Goods.
- MEASURING DRUM driven by machine.
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- ELECTRICALLY OPERATING AUTOMATIC GUIDERS ensures accurate rigging.
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Specialities:

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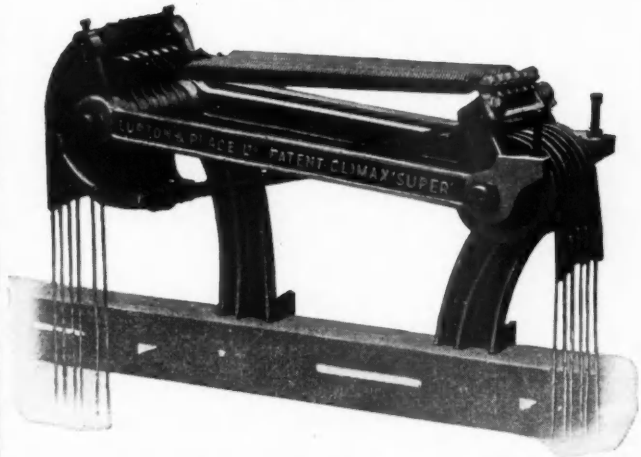
FOR WEAVING DENIMS . . . AND OTHER STOUT CLOTH



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CLIMAX "SUPER"

SPRING TOP MOTION

NO TEETH **NO KNUCKLE JOINTS**
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For cloth woven on 3 to 8 shafts it gives **Better Cloth—Greater Output**—and an infinitely simpler gaiting operation — it cannot get out of truth through wear.

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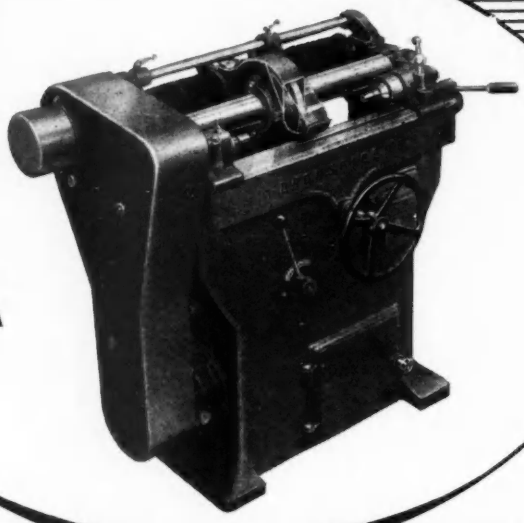
GRINDING MACHINE No. 218

Absolute Accuracy



Specially designed to grind spinning rollers covered with cork, rubber or any synthetic material to a high degree of accuracy, and a perfect finish to the surface of the rollers. Also suitable for leather covered spinning rollers.

DRONSFIELD BROTHERS LIMITED *The Card Grinding Specialists*

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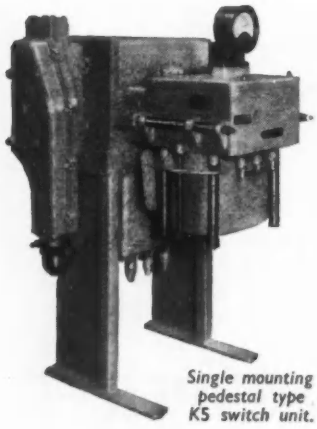

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'K'

medium voltage SWITCHGEAR

—can be installed at the most convenient places

and AS YOU NEED IT

(Pedestal, Panel or Cubicle mounted)

—A good performance is guaranteed

The range of switchgear generally designated "Type K" has been specially developed to provide efficient distribution of electric power within mills, factories, office buildings, etc., where the need for continuous and reliable supply is of the first importance.

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Simplicity of operation and easy maintenance are salient features of this switchgear, whilst adequate interlocks are provided to safeguard the operator.

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A MAJOR BRITISH DEVELOPMENT IN BEARING TECHNOLOGY

Bearings are now available which operate

- ✻ **Completely dry or in most liquids**
- ✻ **Under heavy loads and high speeds**
- ✻ **At temperatures from —200°C. to +250°C.**
- ✻ **In the presence of dust or abrasive particles.**

Nearly 1,000,000 of these bearings are already running in a wide range of mechanisms from gas turbines to textile machinery.

Three materials with different functions have been developed to assist those who wish to design machinery that avoids the use of lubricants.

DU Thin steel strip with a porous bronze coating impregnated with a mixture of a fluoro-carbon (P.T.F.E.) and lead. Supplied in flat lengths or as finished bushes and thrust washers in a range of sizes. Available at low cost from stock.

DQ A fluoro-carbon (P.T.F.E.) strengthened with special fillers and supplied in bars and tubes. A range of diameters is available from stock. Non-standard or irregularly shaped dry bearings can be simply machined from this material.

DM A process of applying an adherent layer about .002" thick utilising the bearing properties of a combination of fluoro-carbon and molybdenum disulphide to the bearing surface of any ferrous part. Such parts must be sent to us for process.

The basic material we use in all these bearings is the "Fluon" brand of Polytetrafluoroethylene supplied to us by I.C.I. Ltd.

DU DU is a new development based on our original DP material which it now supersedes, and provides three times the load/speed carrying capacity of its predecessor.

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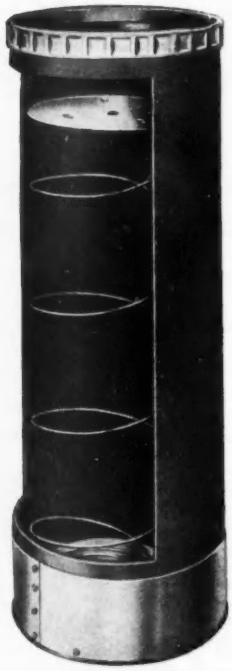

The Fibre Can illustrated above has been cut away to show the Spiral Spring.

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PATENT SPRING GRIP TOP RINGS

are solid drawn Siemen's Steel, no rivets or swageing required. Made solely by us in 9 in., 10 in., 11 in., 12 in. and 14 in. diameter.

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MORE AND MORE MILLS look to "Stowaca" products because of lightness and durability. Manufacturers also of tinned steel, planished steel card cans, boxes, trucks, etc.

BEST QUALITY HARD GENUINE VULCANISED FIBRE CARD CANS WITH PATENT "SPRING GRIP TOP RINGS"

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THE OLDEST CAN MAKERS IN GREAT BRITAIN

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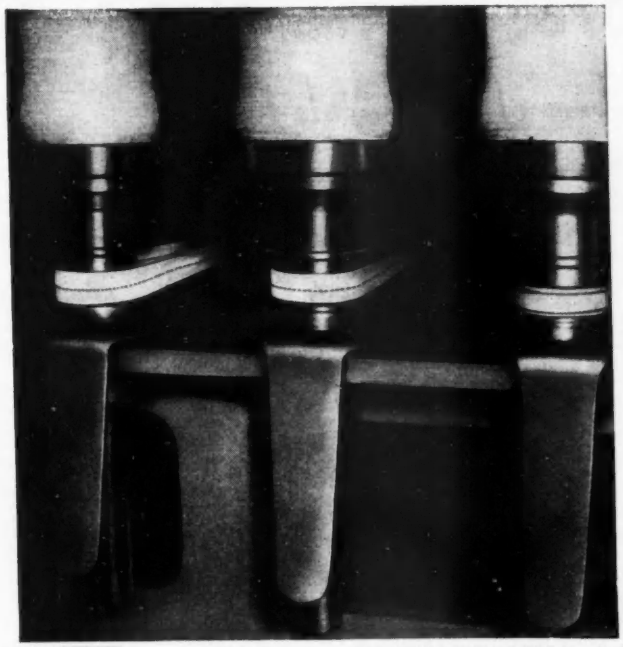

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Also Carpet Binding and Heading Tapes

Spindle Tapes in any weave or material.

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Cotton Warp, and Nylon Weft & Edges.

Tapes and Webbing for all purposes.

Double Loop Bands and "Elaston" Mule Bands.

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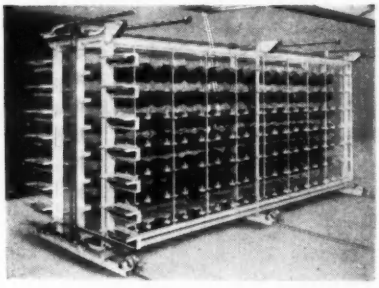

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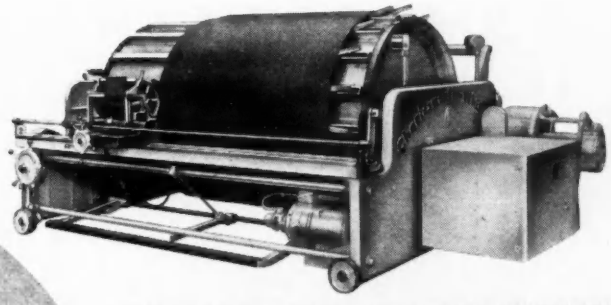

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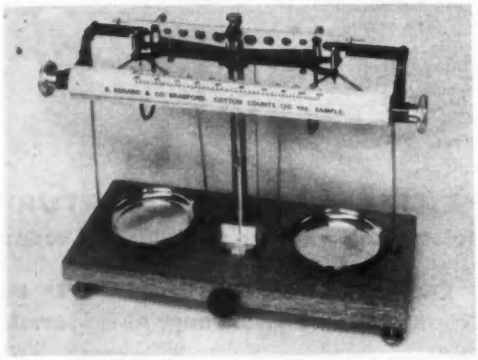

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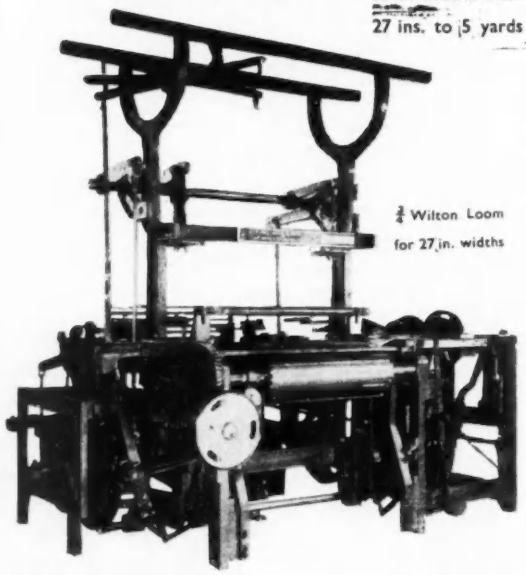

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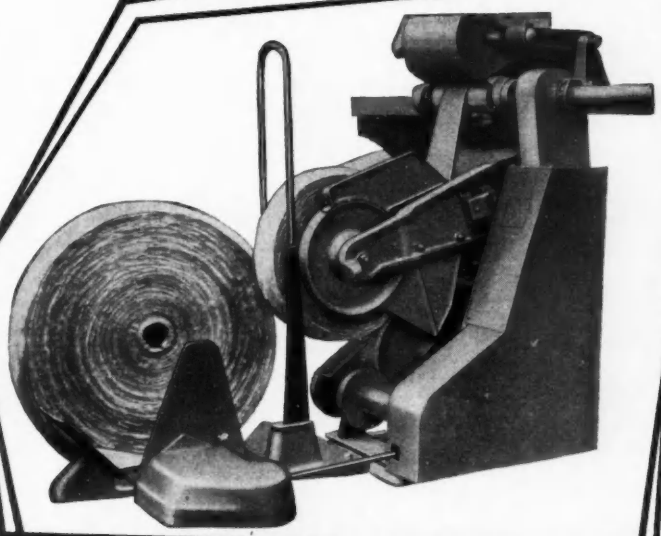

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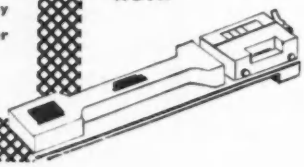

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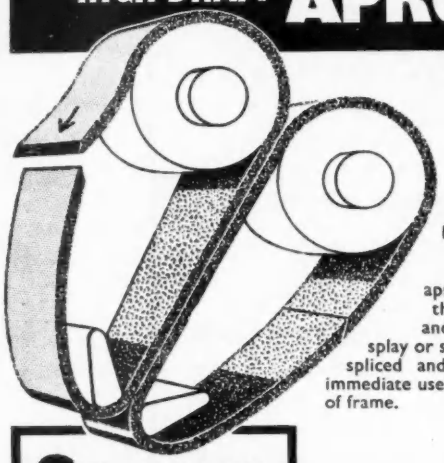

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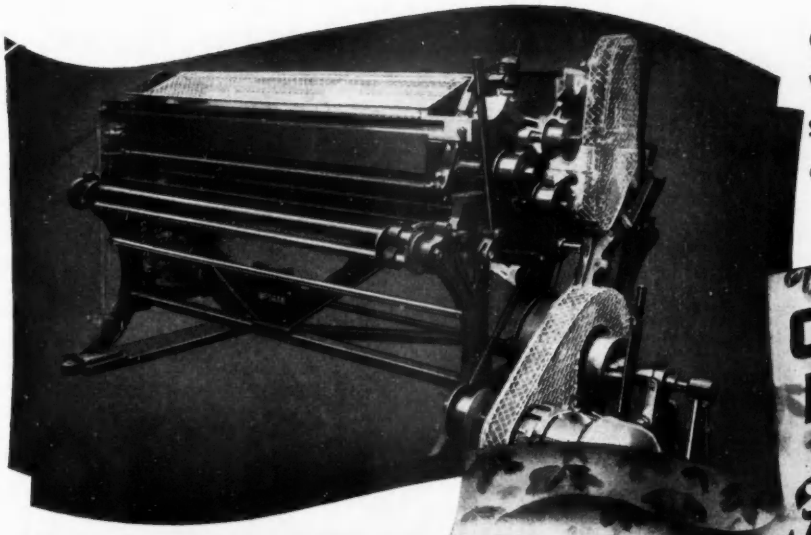

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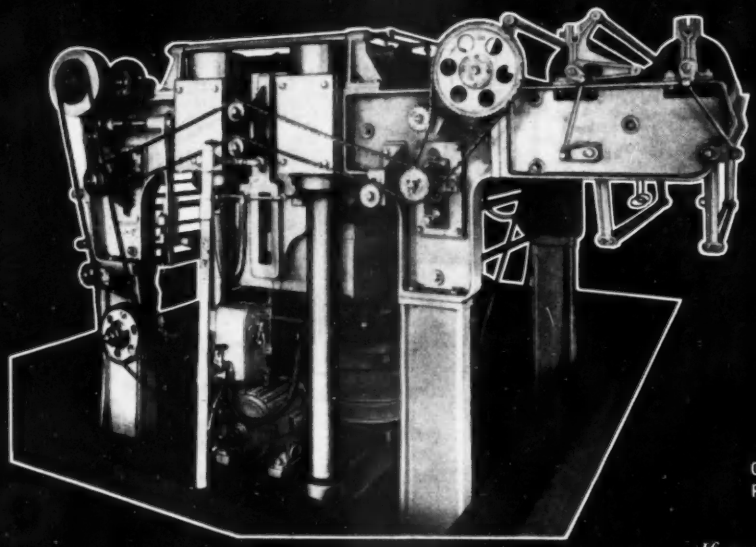

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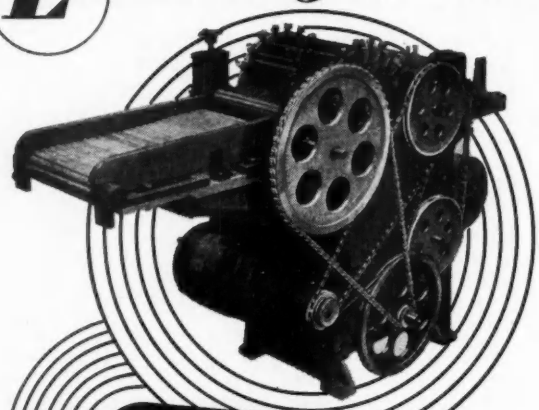

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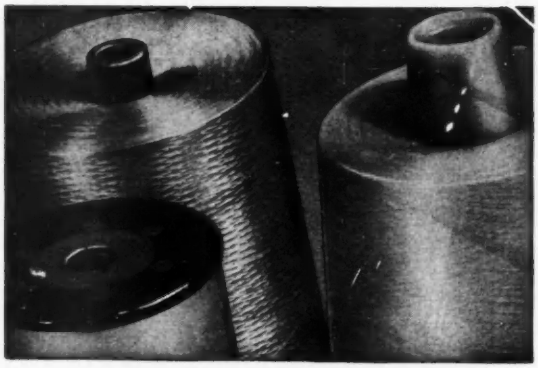

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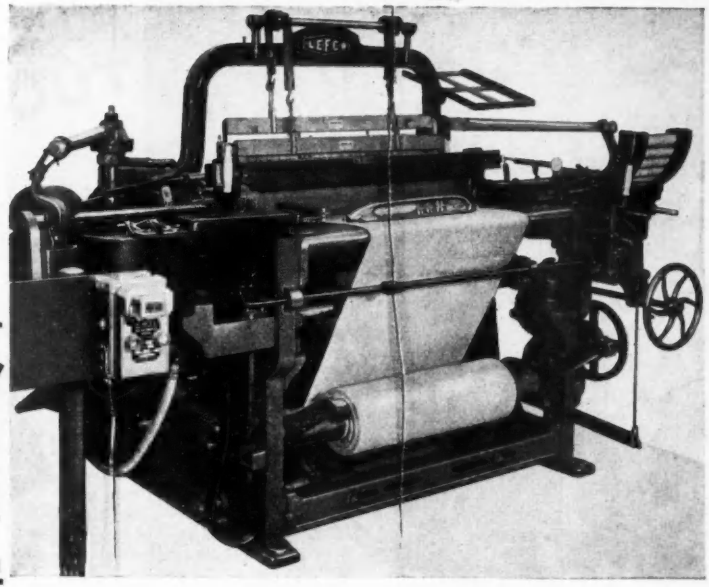

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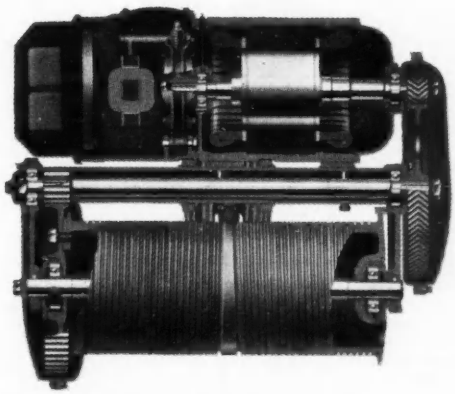

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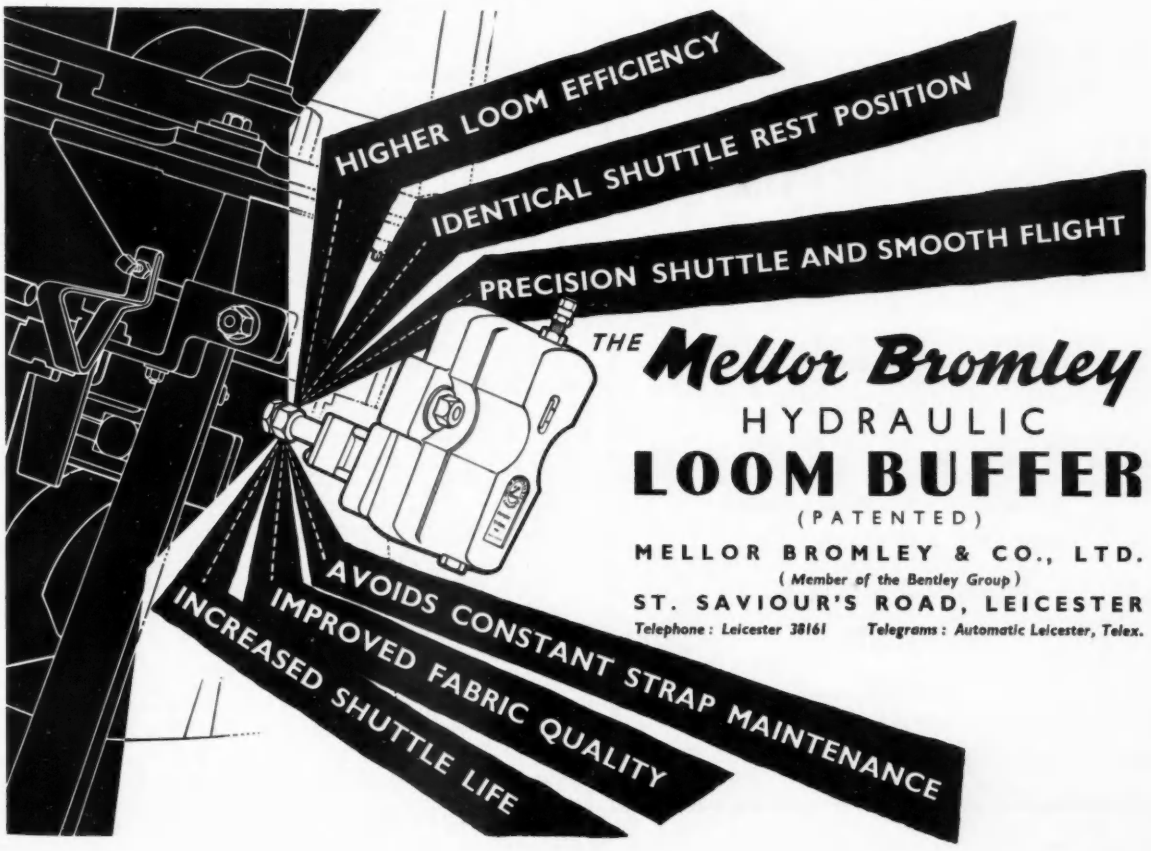

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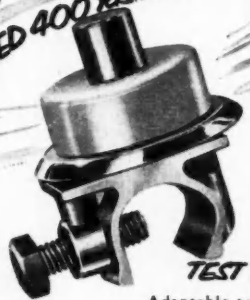

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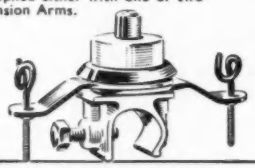

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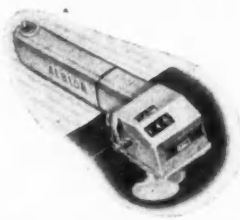

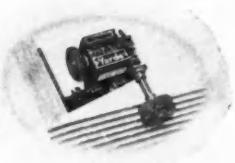

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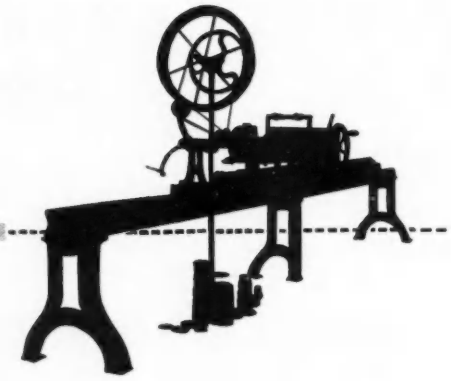

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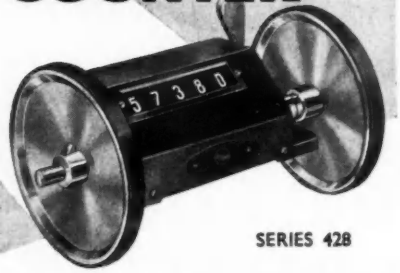

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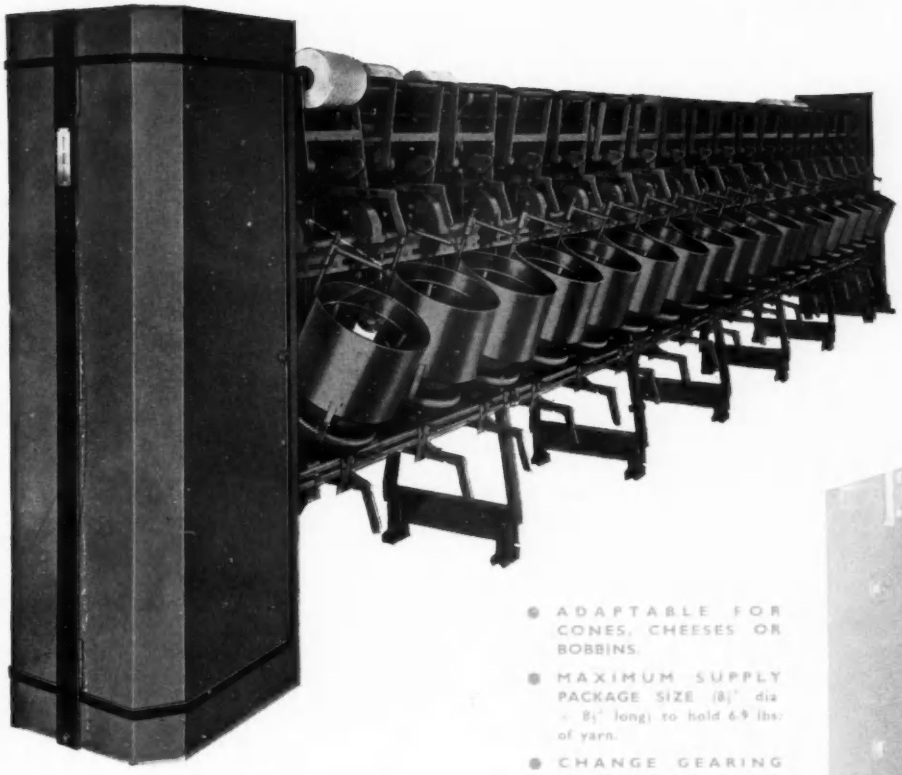

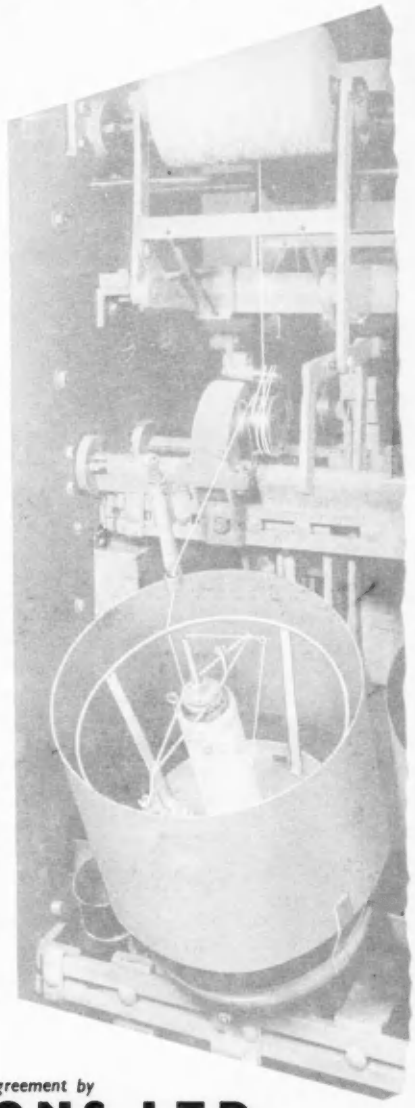

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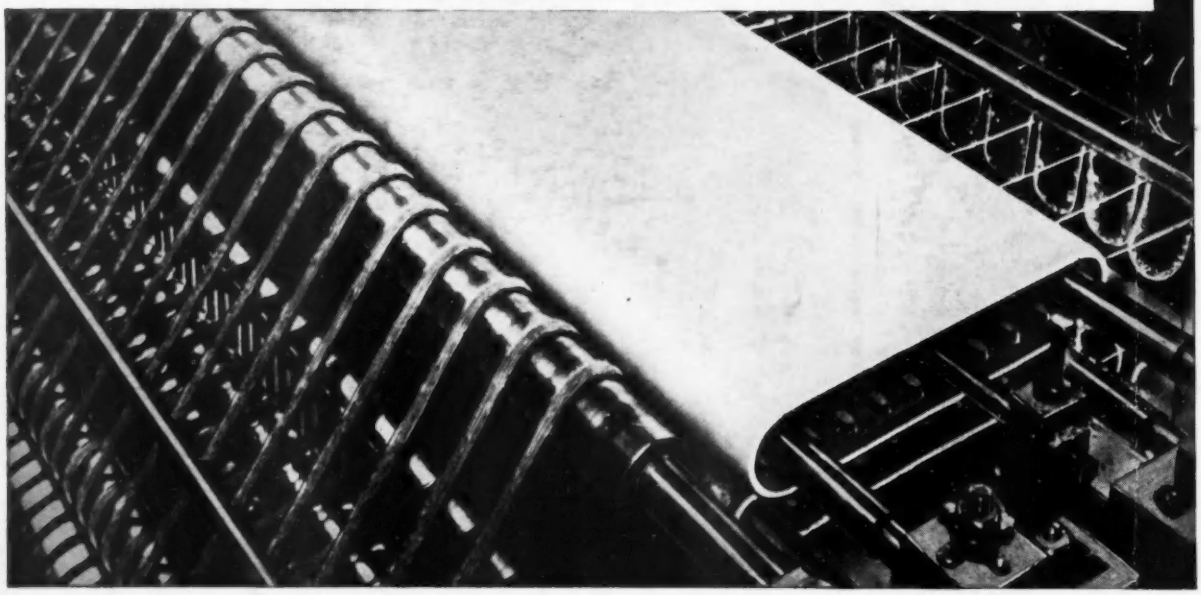

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